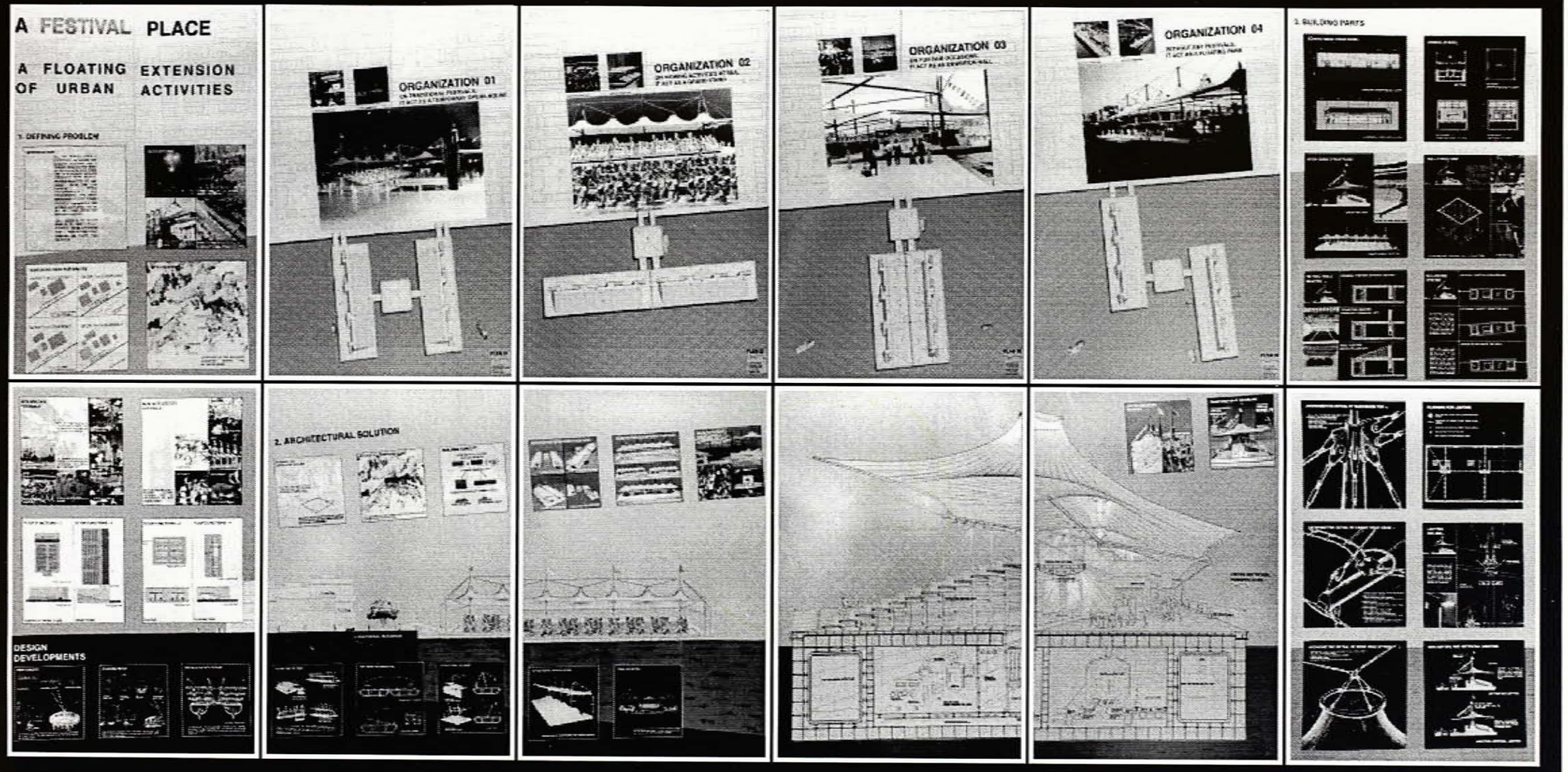
ARCHITECTURE DEPARTMENT **CHINESE UNIVERSITY OF HONG KONG**

MASTER OF ARCHITECTURE PROGRAMME 1996-97 DESIGN REPORT

A FESTIVAL PLACE - A FLOATING EXTENSION OF URBAN ACITIVITIES

MAK Hon Ming Franky April 1997

DESIGN REPORT



BY FRANKY MAK HON MING

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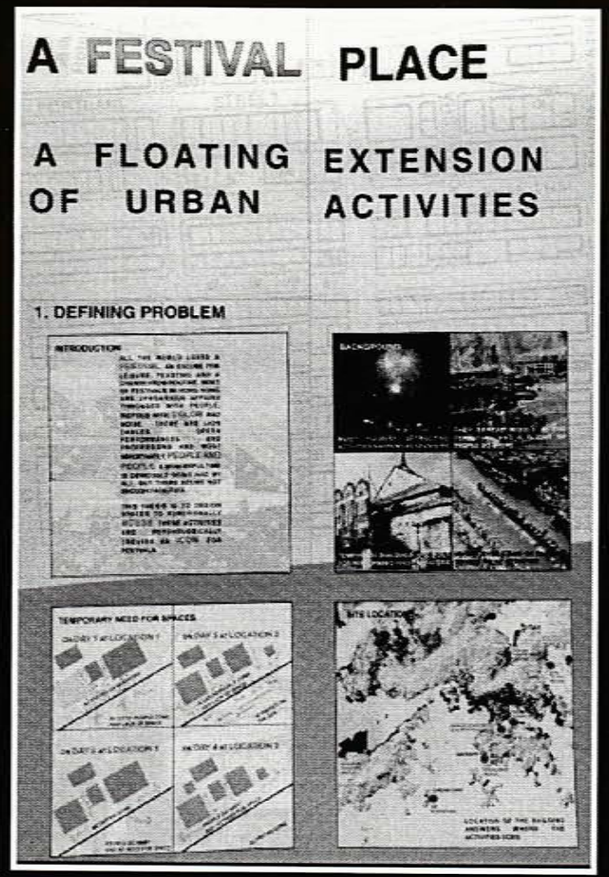
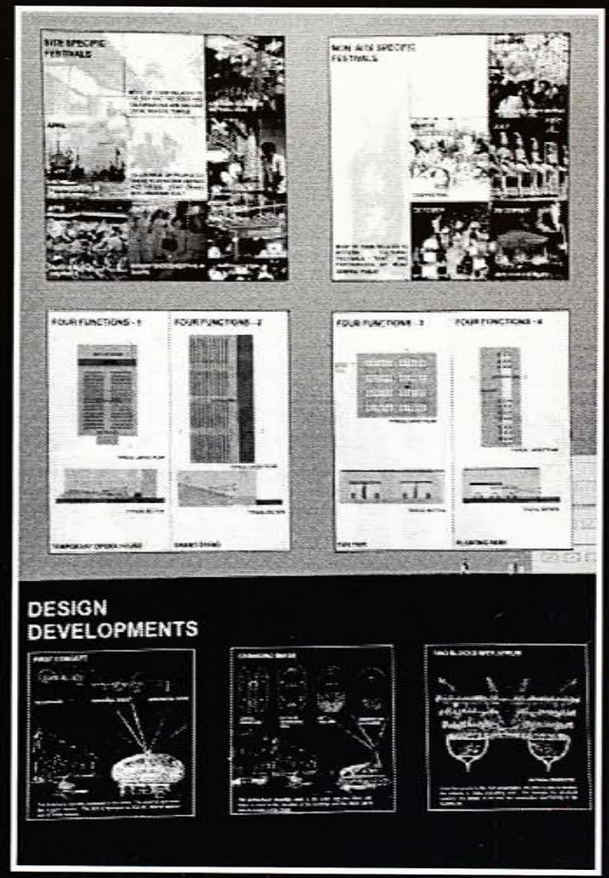


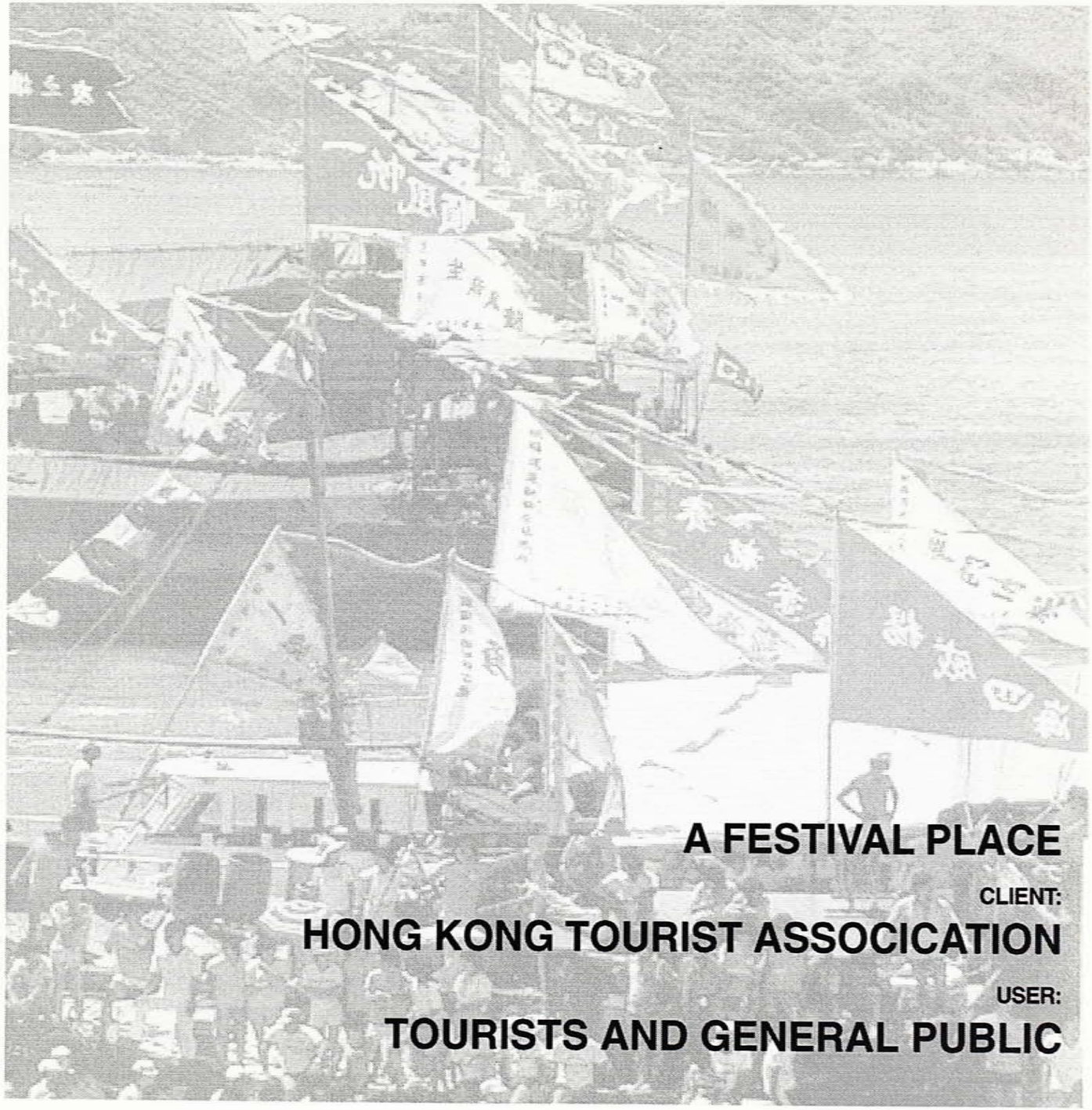


1.1 INTRODUCTION

THE WORLD LOVES FESTIVALS; THEY REPRESENT AN ESCAPE FOR LEISURE. A TIME FOR FEAST AND A CHANGE FROM ROUTINE. MANY FESTIVALS IN HONG KONG ARE HELD AROUND THE SEASHORE. THERE ARE LION DANCES, OPERA PERFORMANCES, AND MOST IMPORTANTLY, THEY OFFER AN OPPORTUNITY FOR PEOPLE TO MEET AND INTERACT. HOWEVER, THERE ARE NOT ENOUGH URBAN SPACES AND FACILITIES TO ACCOMMODATE THESE ACTIVITIES.

THIS THESIS SUGGESTS A WAY TO DEAL WITH THE LACK OF SPACE BY UTILIZING A 'FLOATING ARCHITECTURE' WHICH WILL NOT ONLY FUNCTIONALLY HOUSE THESE ACTIVITIES AND CONTAIN THESE ACTIVITIES, BUT ALSO PSYCHOLOGICALLY CREATES AN ICON TO SYMBOLIZE THE SPIRIT OF THESE FESTIVALS.

DEFINING PROBLEM



A FESTIVAL PLACE

CLIENT:

HONG KONG TOURIST ASSOCICATION

USER:

TOURISTS AND GENERAL PUBLIC

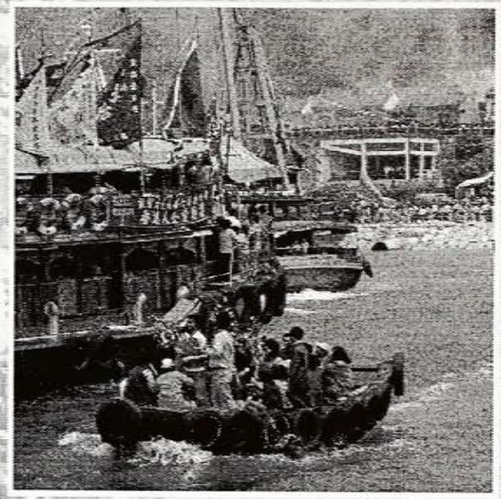
1.2 BACKGROUND

The originality of the design comeS from my personal experience of some tourist attracting activities happening at the harbour. At that moment, there are millions of people crowded at the seashore viewing at the harbour. I think that why in Hong Kong there are no such extra space for people to view these activities if certain festivals happen at some place.

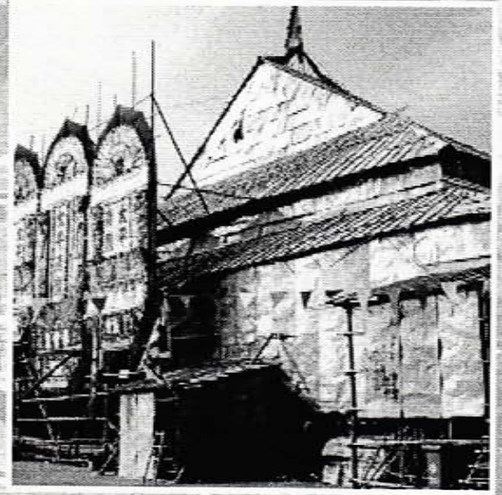
THIS MAKE ME CONVINCED OF BUILDING A MOBILE SPACE THAT CAN SERVE AS AN EXTENSION OF LAND TO HOUSE THESE ACTIVITIES WHEN A LOT OF PEOPLE GO THERE.

DEFINING PROBLEM

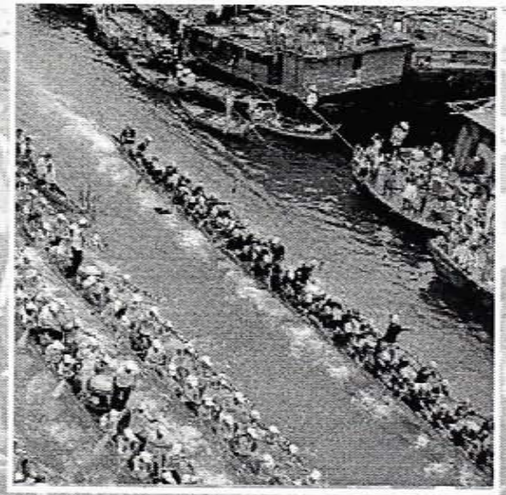
MOST TOURIST ATTRACTING ACTIVITIES HAPPENS AT SEASHORE OR AT SEA



THEY SPREAD WIDELY IN THE TERRITORY AND A FLIGHT OF PEOPLE GO THERE



TEMPORARY BUILDINGS ARE BUILT FOR PERFORMING THESE ACTIVITIES



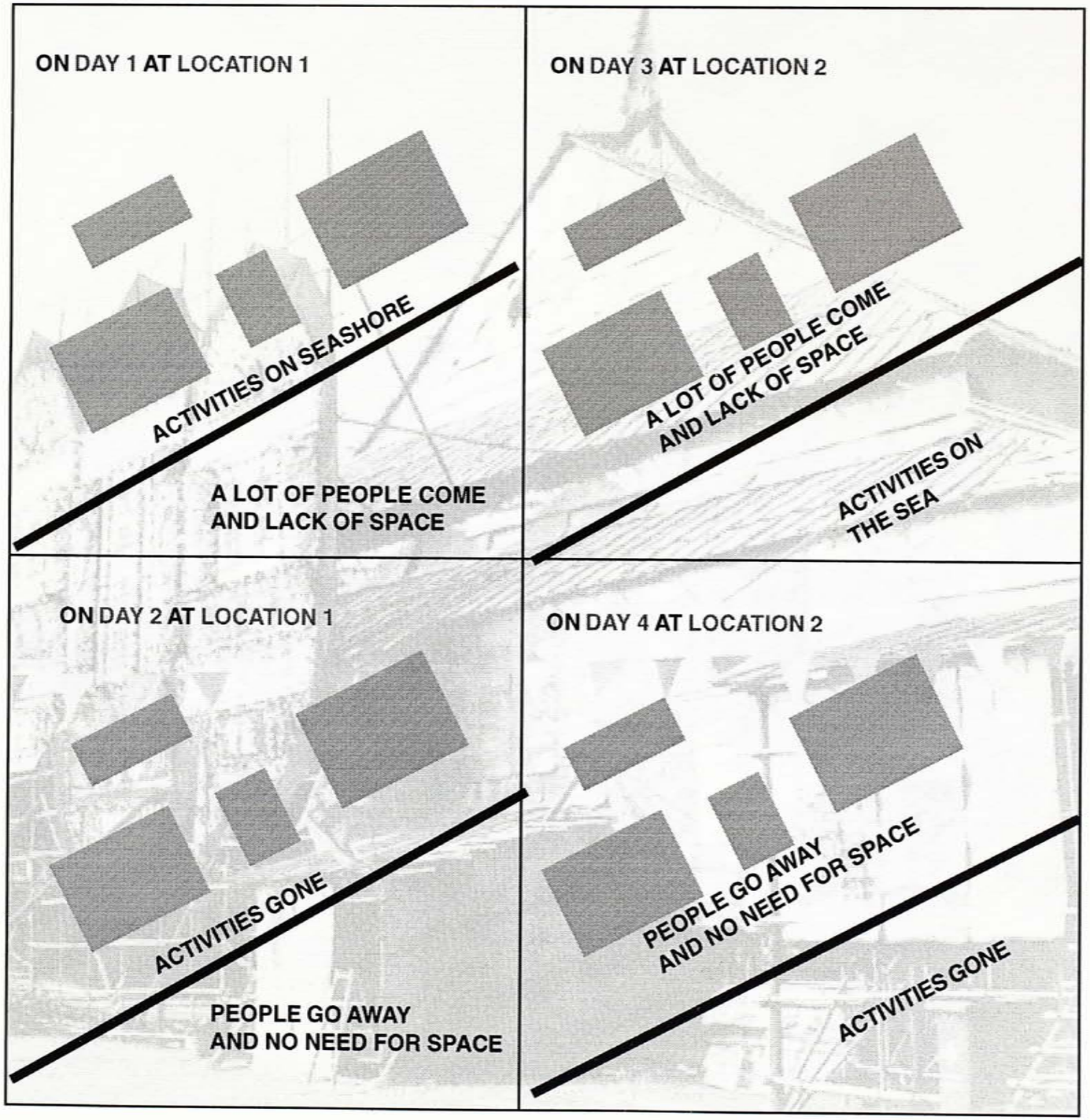
PEOPLE EVEN STAND ON SAMPANS TO VIEW THESE ACTIVITIES

1.3 TEMPORARY NEED FOR SPACES

One of the most important aspect of this project is the location for this building. In determining this, an analysis of the scenerio of the festivals is shown.

From the four diagrams, it shows the need of the space is very temporary in relation to the activities.

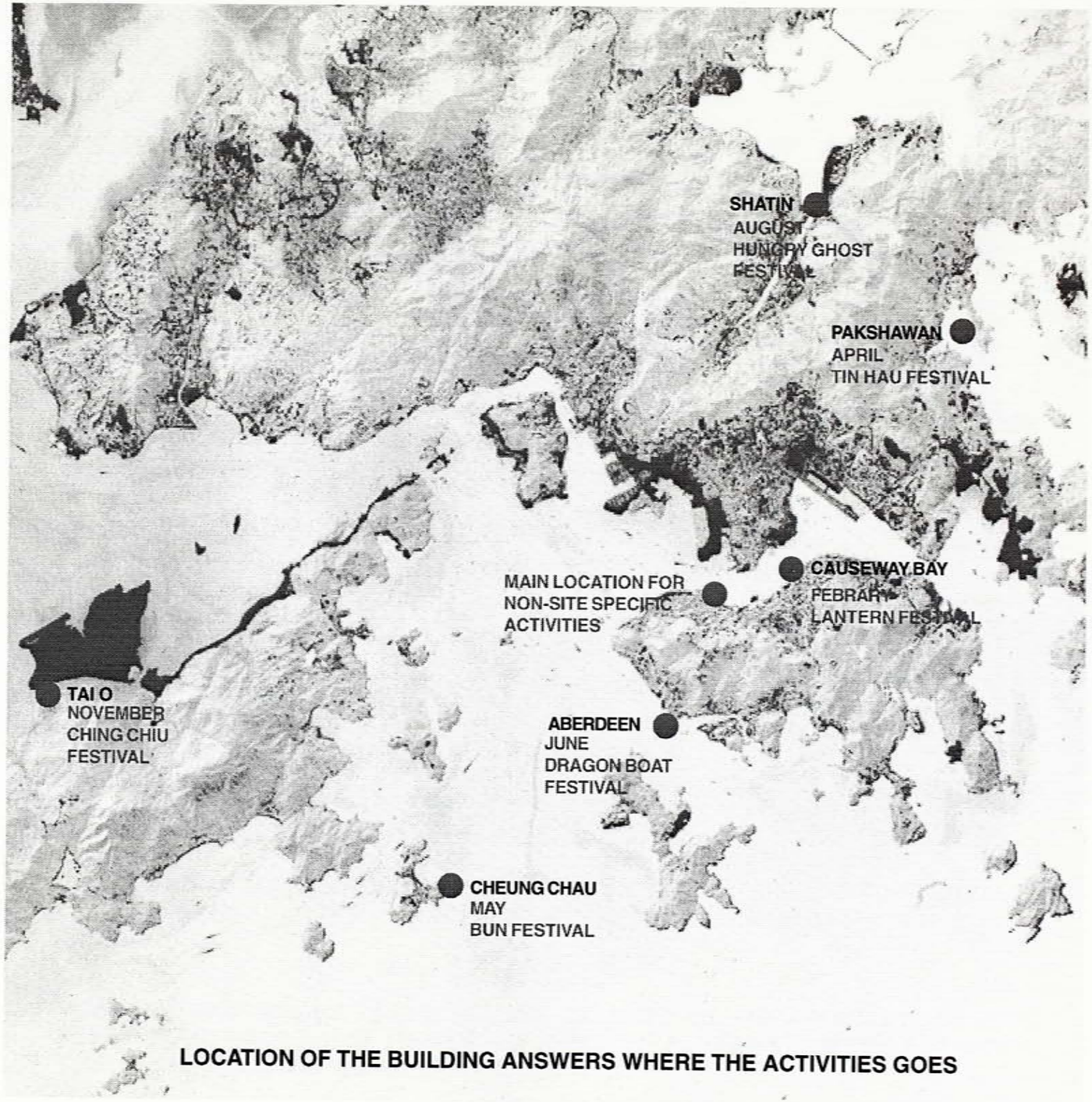
DEFINING PROBLEM



1.4
SITE LOCATION

The next thing to determine is the actual location of the building. As the building locates at where the activities goes or where the festival happens, the analysis of the festivals in Hong Kong should be studied.

DEFINING PROBLEM



LOCATION OF THE BUILDING ANSWERS WHERE THE ACTIVITIES GOES

1.5
SITE SPECIFIC FESTIVALS

Most of these festivals relate to the sea since traditionally, Hong Kong has beena fishing village. There are many celebrations of gods at different occasions.

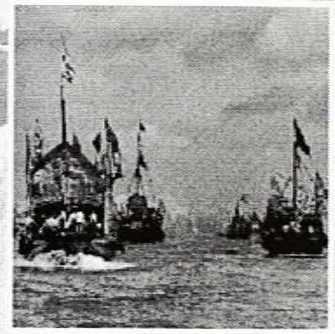
There are flights of people go there to view these celebrations and activities. Temporary buuildings are built for the visitors.

DEFINING PROBLEM

JANUARY

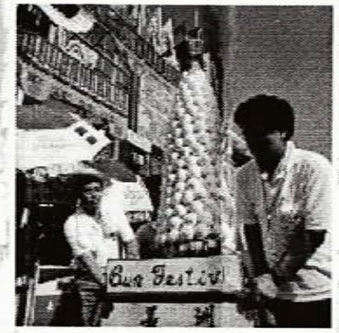
LANTERN FESTIVAL IN VICTORIA PARK

APRIL



TIN HAU FESTIVAL IN PAK SHA WAN

MAY

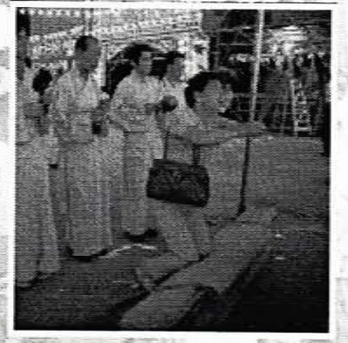


BUN FESTIVAL IN CHEUNG CHAU

JUNE

DRAGON BOAT IN ABERDEEN

AUGUST



HUNGURY GHOST FESTIVAL IN SHATIN

NOVEMBER

CHING CHIU FESTIVAL IN TAI O

MOST FESTIVALS RELATE TO THE SEA AND CELEBRTIONS ARE AROUND TEMPLES AT SEASIDE. AS CROWDS OF PEOPLE GO THERE TO PERFORM CERTAIN ACTIVITIES, TEMPORARY BUILDINGS ARE BUILT.

1.6 NON -SITE SPECIFIC FESTIVALS

In Hong Kong there are also many non-site specific festivals that attract both tourists and citizens. most of them are modern cultural festivals that can arise the attention of the general public to specific items.

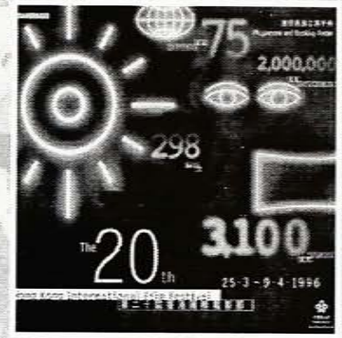
Sometimes in Hong Kong, these activities are held at places that requires special attention and they are not well advertised. Therefore, I would like to design a place that can assist in advertising these festivals and participated by general public.

DEFINING PROBLEM

FEBURARY

NEW YEAR FLOWER MARKET

MARCH



FILM FESTIVAL

JULY

INTERNATIONAL CARNIVAL

SEPTEMBER

MID-AUTUMN FESTIVAL

OCTOBER

ARTS FESTIVAL

DECEMBER

NEW YEAR EVE PARTY

MOST OF THEM RELATES TO MODERN CULTURAL FESTIVALS THAT ARE PARTICIPATED BY MOST GENERAL PUBLIC

1.7 PROGRAMME

The programme of this project is rather simple. It just include one floating space that can be adjusted and configered for different functions. There include four basic functions:

AS A SPACE FOR THEATRE for around 1000 s.m.

AS A SPACE FOR GRAND STAND which is flexible for around 1500 seats

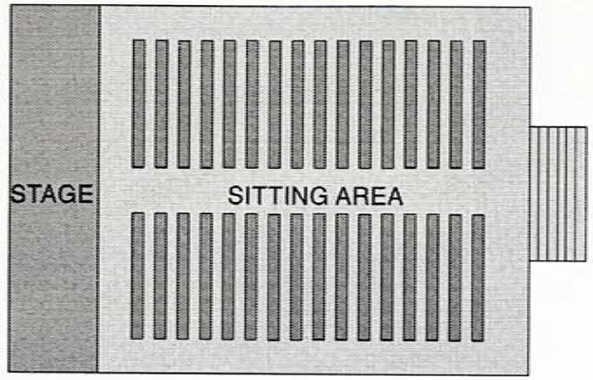
AS A SPACE FOR EXHIBITIONS which is flexible in size of about 1000s.m.

AS A SPACE FOR FLOATING CAFE

Apart from these main spaces, there includes service spaces: washrooms, diesel generator room, sewage treatment room, storage spaces and snack kiosks

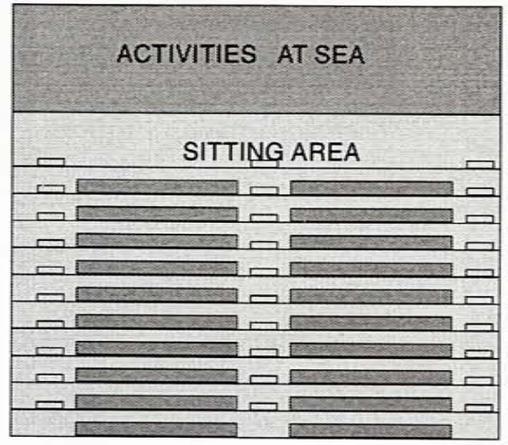
DEFINING PROBLEM

SPACE FOR THEATRE



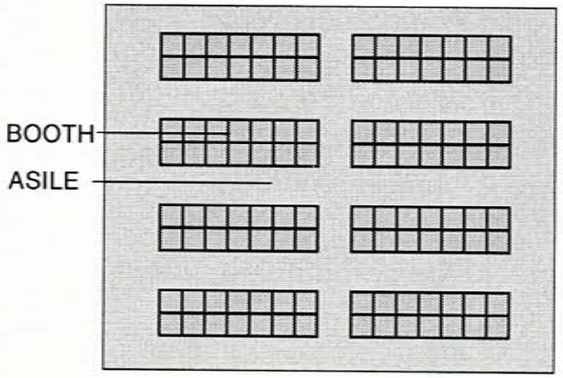
SITTING AREA FOR ABOUT 1000 PEOPLE
STAGE FOR ALL PURPOSE PERFORMANCE

SPACE FOR GRAND STAND



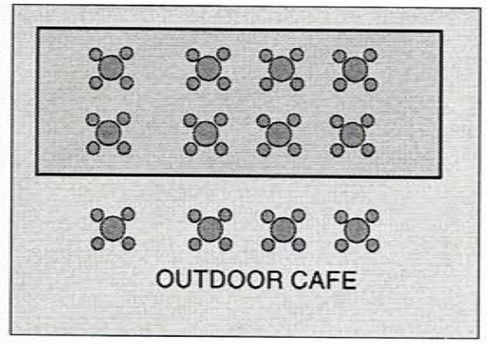
SITTING AREA FOR ABOUT 1800 PEOPLE
ENTRANCE AND TICKETING AREA

SPACE FOR EXHIBITION



EXHIBITION AREA AROUND 800 S.M.
ALLOWING PLACEMENT OF EXHIBITION BOOTH

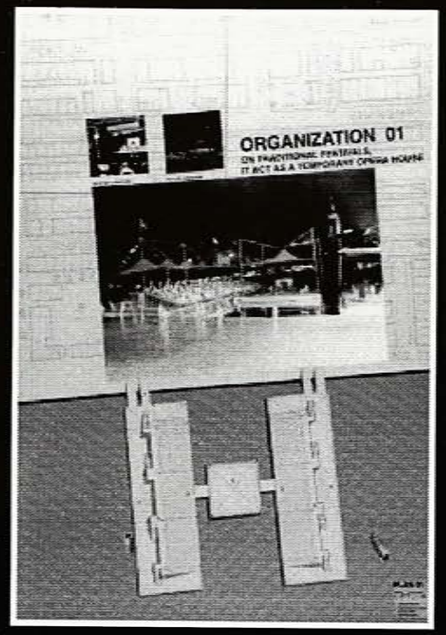
SPACE FOR FLOATING CAFE

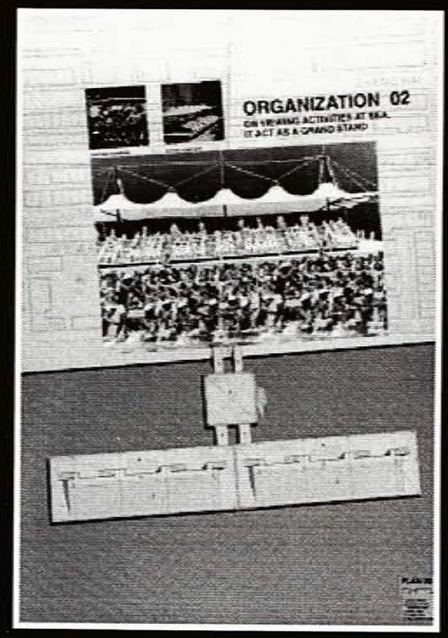


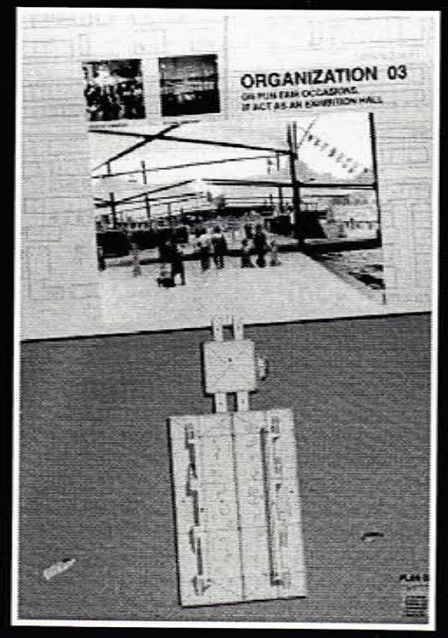
VARIABLE CAFE SITTING AREA
WITH SNACK KIOSKS AROUND 12 S.M. EACH

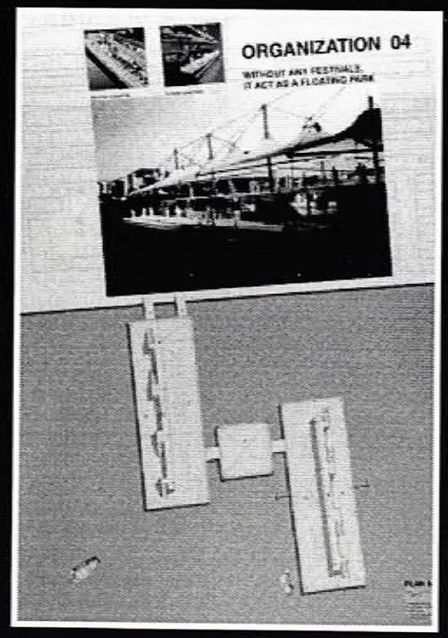
2

DESIGN SOLUTION







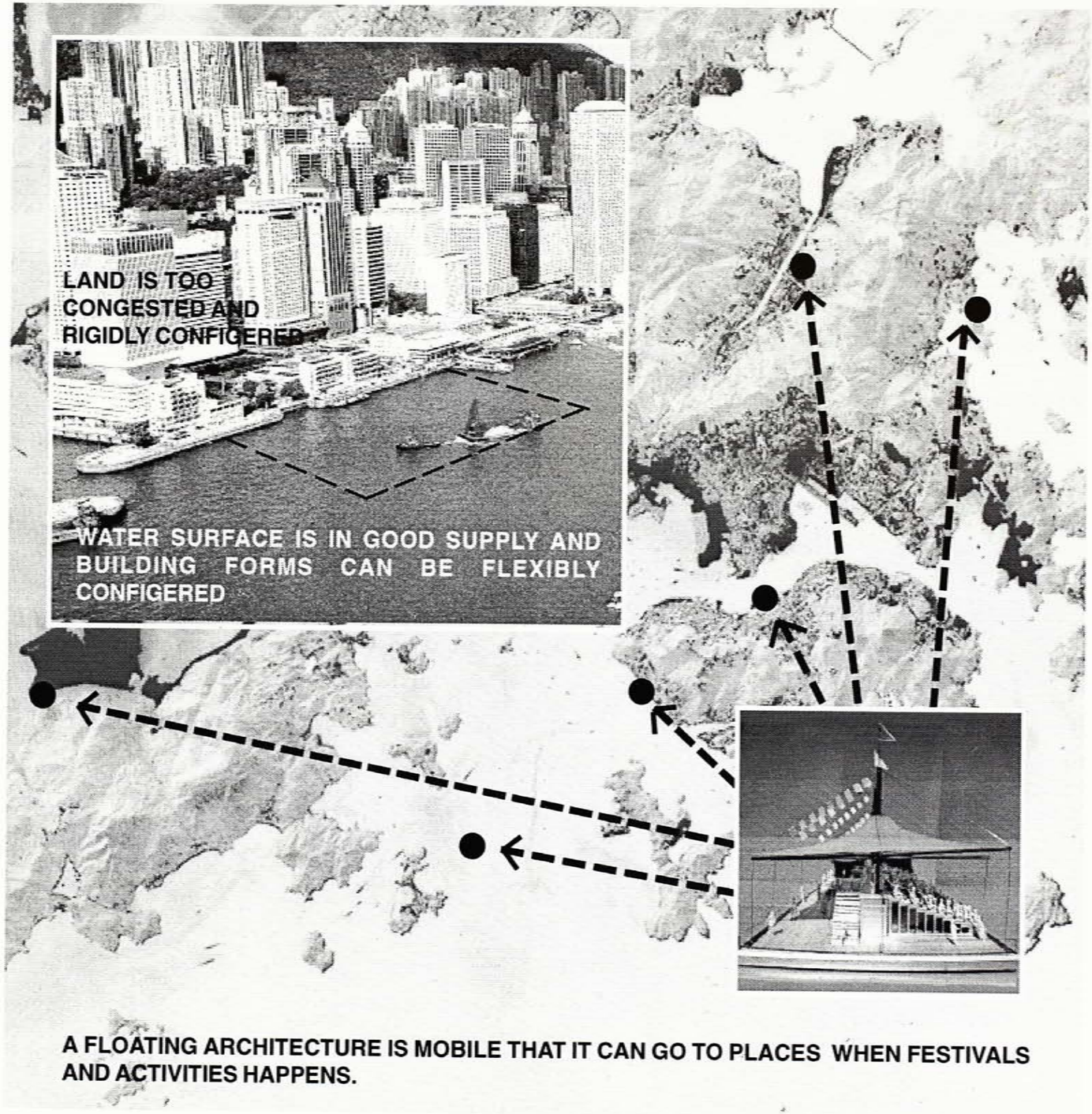


2.1
SITE EVOLUTION

In order to find a place for people to perform certain activities, existing contextual profile is studied. In Hong Kong, land is very congested and rigidly configered. There are not much space left. However, as Hong Kong is basicallly composed of islands, we have planty of water surface. That make me think of building on the water surface.

Another adventage of building on water surface is the building is mobile. This matches with the intent that the building is mobile to where the activities goes. It just like a boat that it can parked to different piers at different time where specific festivals happens there.

DESIGN SOLUTION



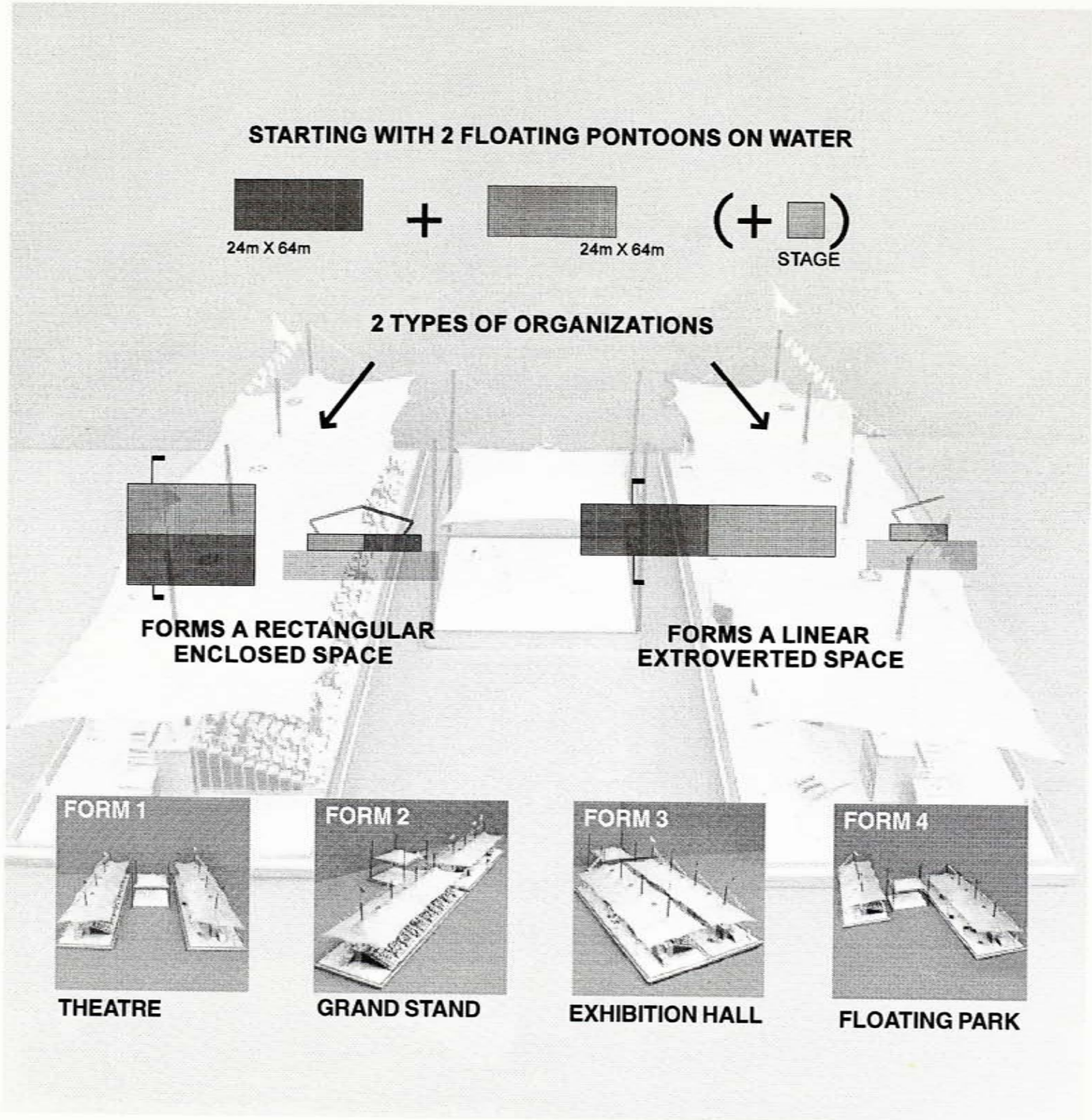
A FLOATING ARCHITECTURE IS MOBILE THAT IT CAN GO TO PLACES WHEN FESTIVALS AND ACTIVITIES HAPPENS.

2.2 BUILDING ORGANIZATION

One thing the at different from normal buildings are the building organization. As this building is floating on water, the arrangment of the building is flexible. According to the functional requirements of the project, there are four main different organizations in different occasion.

The approach of the solution is to start with two floating pontoons, each 22m X 64m. From this two pontoons, we can have two very different combinations, one rectangular and enclosed, suitable for viewing activities at the centre. The second combination forms a linear and extroverted space, suitable for viewing activities outside the building.

DESIGN SOLUTION

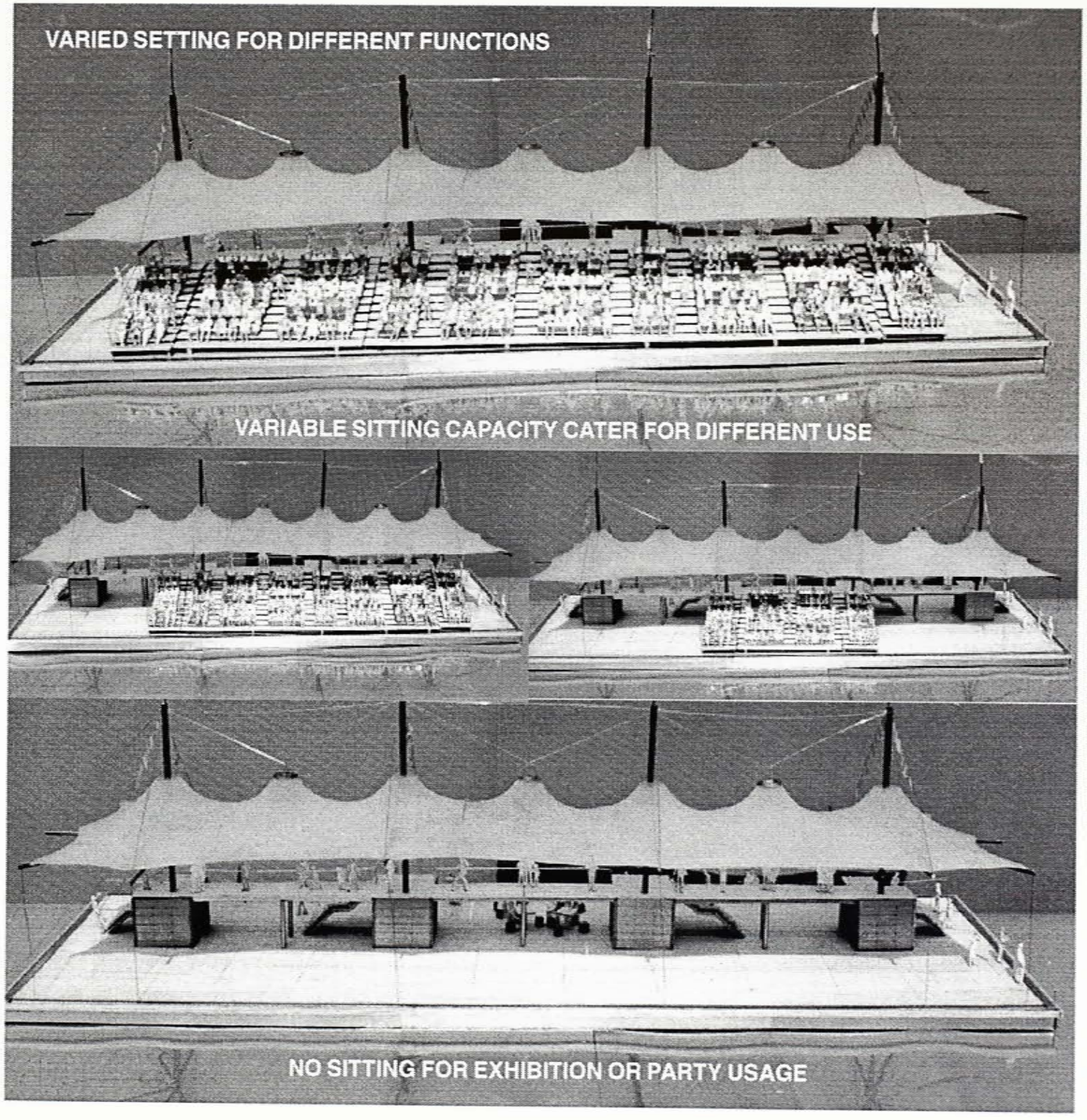


2.3
FLEXIBLE SETTING

To serve for different functions, only the variation of planning organiztion is not enough . There should also include variable physical setting. For example, when the building is used as the theatre, seating should be laid for audience. When the building is used as an exhibition hall, an empty space should be provided.

Therefore, a retractable sitting system should be provided. To design more than just the presence and absence of the sitting area, the sitting capacity should also be varied for different number of visitors.

DESIGN SOLUTION



2.4
ICON FOR FESTIVALS

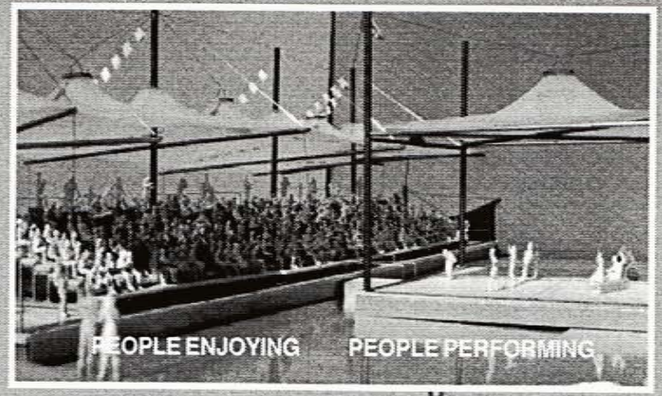
Apart from the functional requirements of the project to be fulfilled, the architectural image of the building is also important. In this project, the most important image for the building is to show the feeling of festivals. In my mind, there are three elements for the festivals to be held.

1. PEOPLE ENJOYING
People is the most important element for the festivals to be recognized. The architectural space should provide a suitable and comfortable atmosphere for them to enjoy.

2. PEOPLE PERFORMING
To have people enjoying, there must be someone performing something.

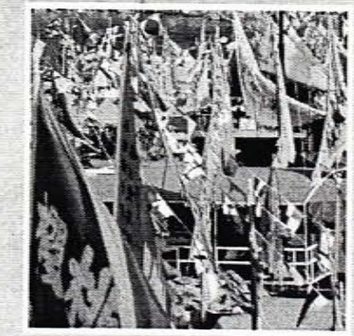
3. FLAG SEA
It is a tradition language to show there is festival happening. Everyone understand there is sonething unusual happening.

DESIGN SOLUTION



PEOPLE ENJOYING

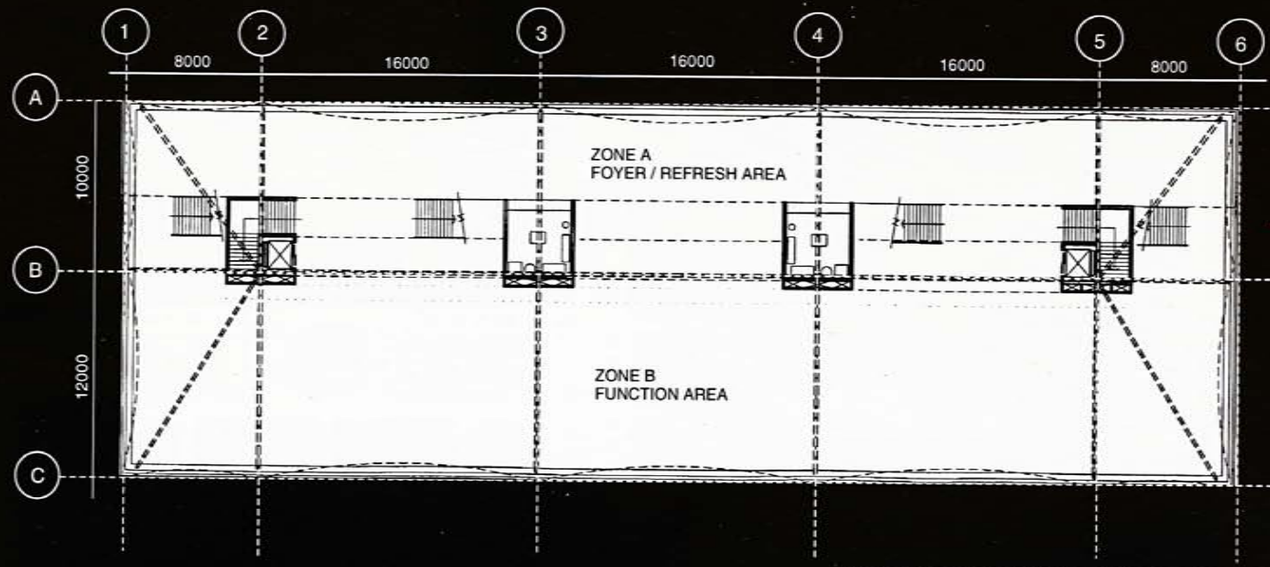
PEOPLE PERFORMING



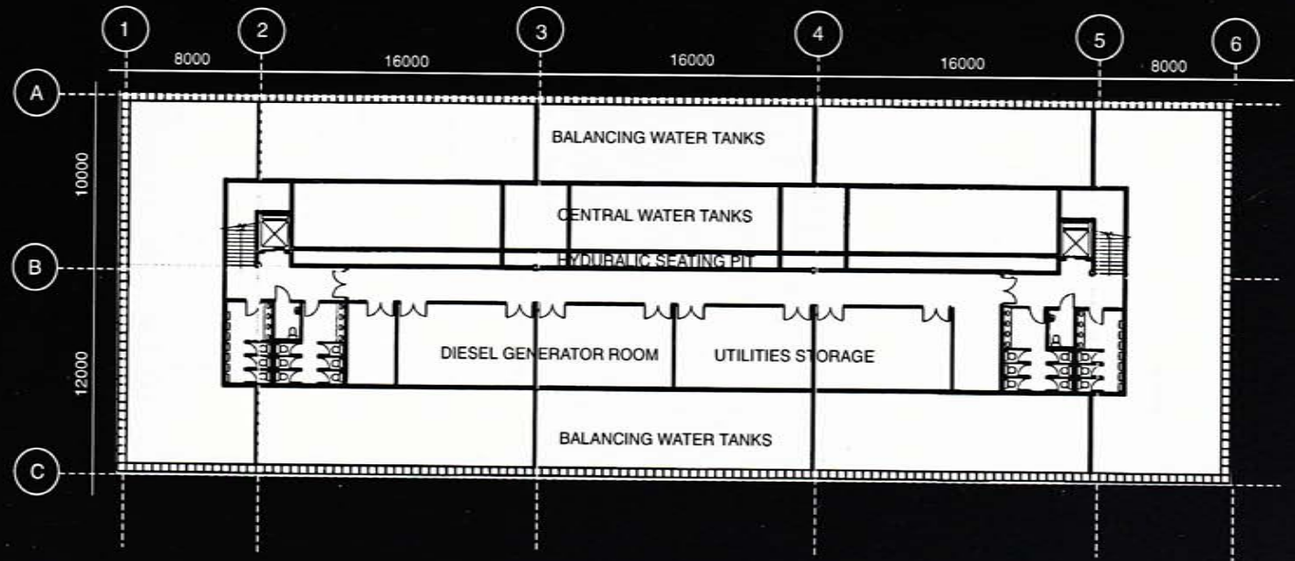
FLAG SEA

2.5 ZONING (MAIN STRUCTURE)

The zoning of the ground floor is very simple that only include two distinctive zones. The main function area and the foyer / refresh area. The basement level are the service floor that include all the plwnt rooms, engine rooms and washrooms. It also include the hyduralic jet pit for the retractable seating area.



GROUND (HABITABLE) FLOOR



BASEMENT (SERVICE) FLOOR

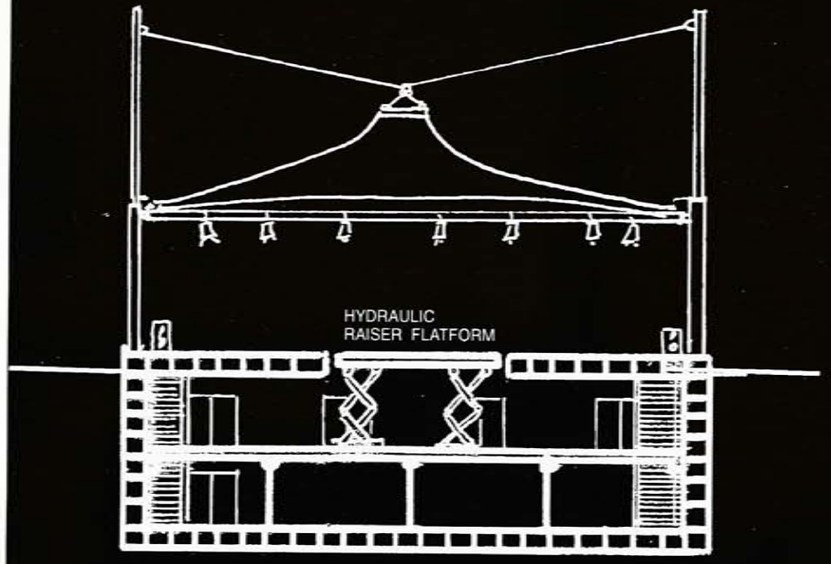
DESIGN SOLUTION

2.6 ZONING (STAGE)

The zoning of the stage includes three zones. The ground level is the performance area. There are two basement levels. The first basement includes pops storages and the green area for the performer to wait for performance. There is a hydraulic platform connecting the ground level and the basement 1 level so that the performer can be raised from it to the performance level.

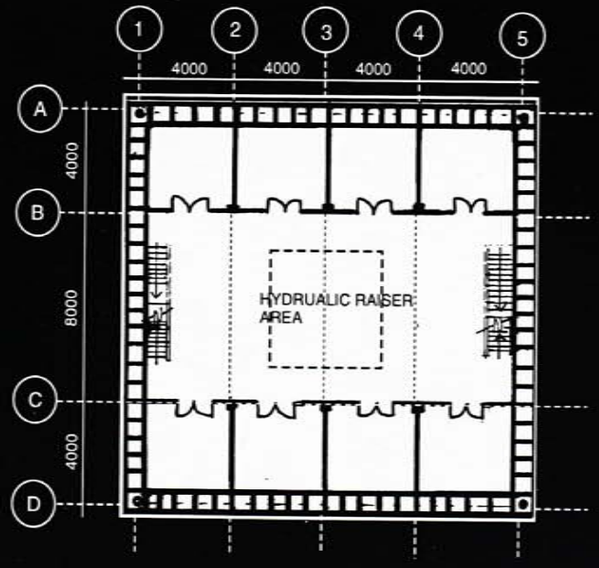
The basement 2 level includes the dressing rooms for the performers and toilets. It also includes the mechanical stuffs and power generator rooms.

DESIGN SOLUTION

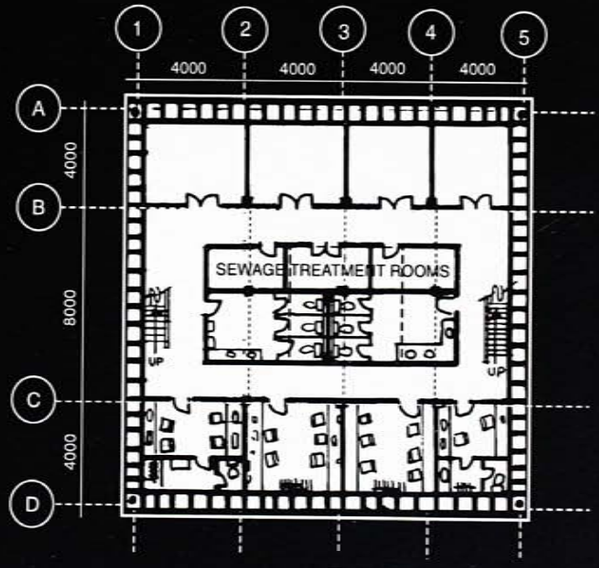


SECTION

GROUND
(PERFORMANCE FLOOR)



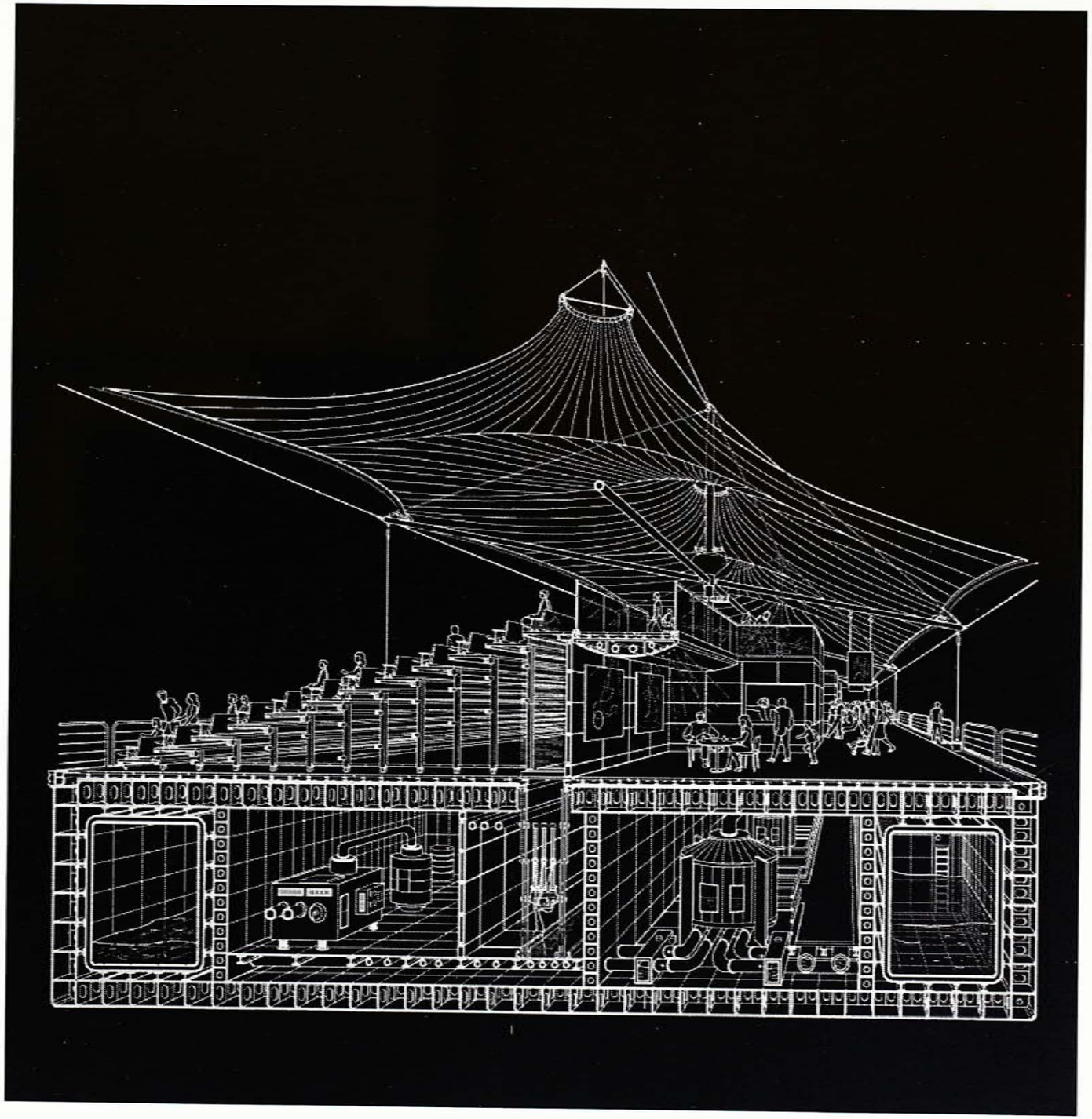
BASEMENT 1
(PREPARATION FLOOR)



BASEMENT 2
(SERVICE FLOOR)

3

STRUCTURE AND SERVICES



3.1
ROOF
(MAIN STRUCTURE)

The structure of the floating building is a pure tensile one. In order to determine the appropriate structural system, a few criteria is considered:

1. The structure must be a light one which can express the lightness of the sea and water.

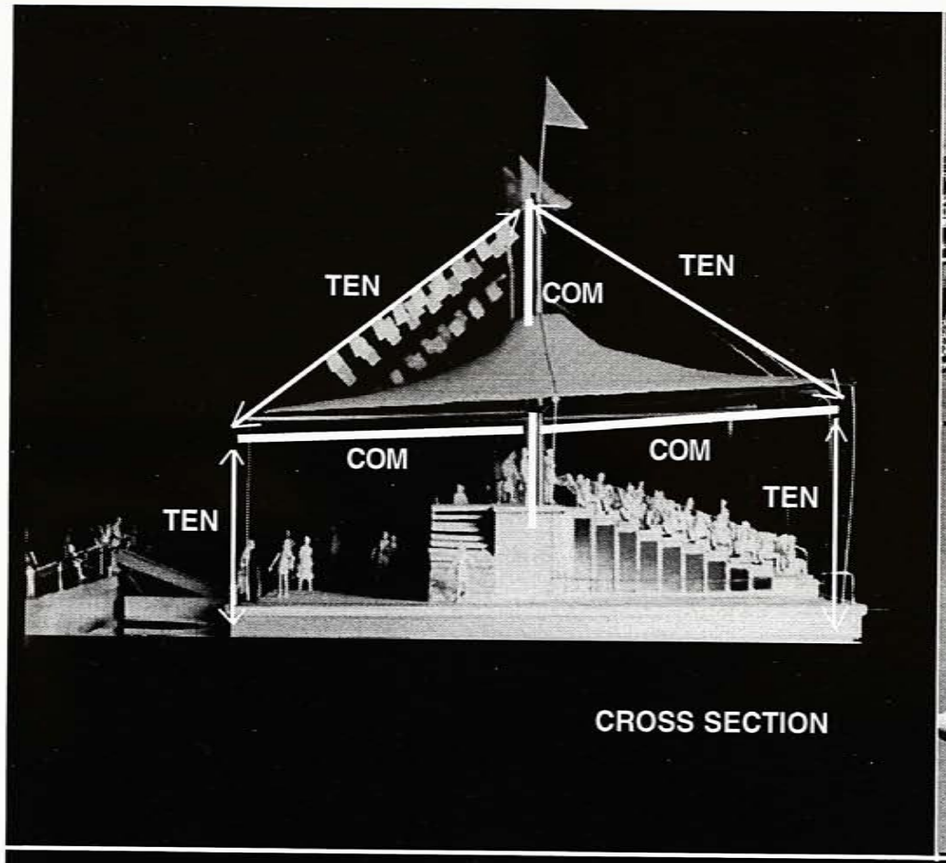
2. The structure is an open one, without the need for enclosure.

3. The structure uses as little supports as possible so that it does not obstruct the view out.

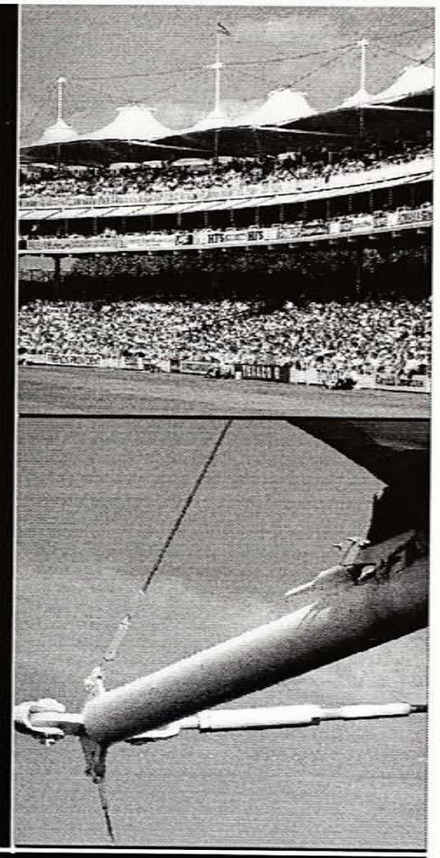
4. The structure should divide the plan into two main zones, one for the main function zone and the other for the refresh / pre-function zone.

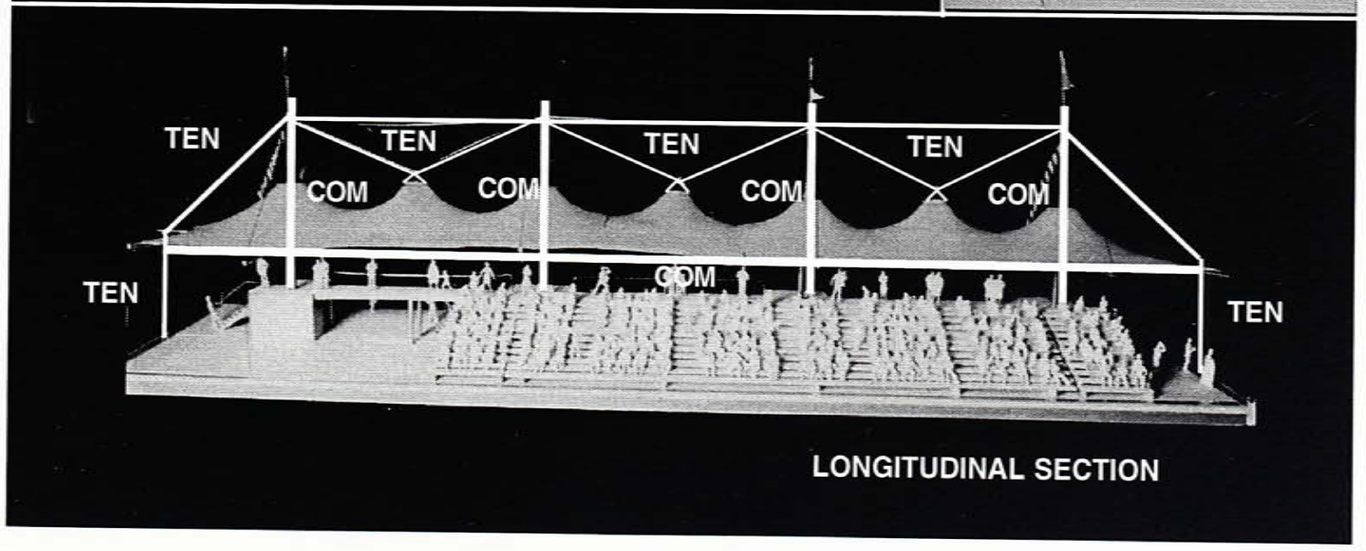
The resulting solution is shown at the right with analysis of tension and compression members.

STRUCTURE AND SERVICES



CROSS SECTION





LONGITUDINAL SECTION

3.2 CONSTRUCTION

CONSTRUCTION SEQUENCE

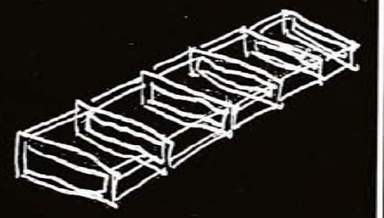
The construction of this floating building is not as the same as the construction of normal buildings. It is built at shipyard and then transferred to the site. As the whole sequence is built inside a "factory", the quality can be better controlled and the environmental impact in construction process is minimized. The construction sequence is illustrated in the right diagram.

MAINTENANCE

The maintenance of the building is done also in the shipyard. The main part of the building needs maintenance is the cleaning of the roof. It can be done easily using the catwalk systems persent in the shipyard so that the catwalk system can be absent in the building.

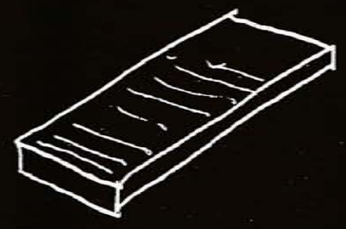
STRUCTURE AND SERVICES

SEQUENCE 1



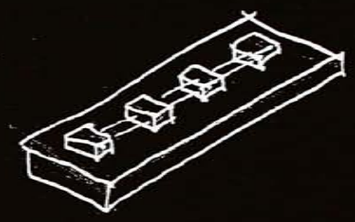
THE HULL STRUCTURE IS MADE BY WELDING

SEQUENCE 2



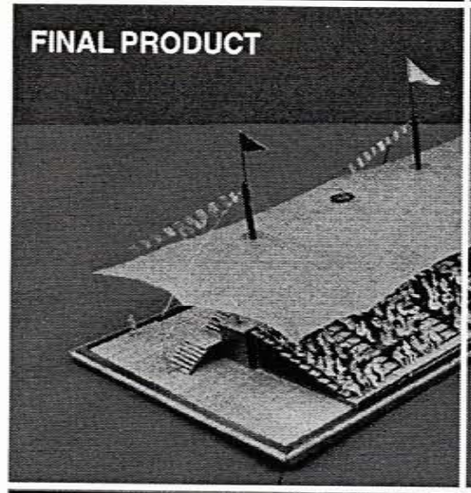
STEEL PLATES ARE WELDED TO THE STRUCTURE AND WOOD DECKING IS LAYERED

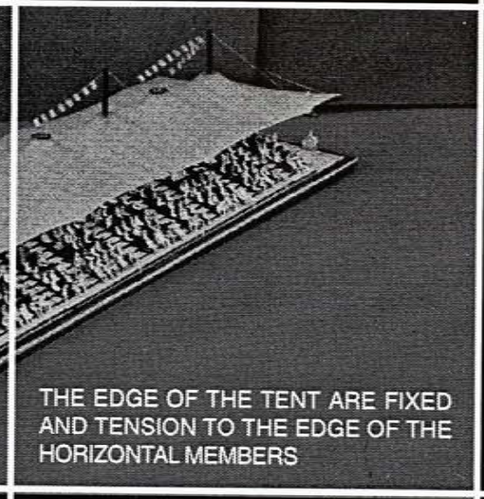
SEQUENCE 3



STRUCTURE OF THE SNACK KIOSKS AND THE BRIDGE IS BUILT

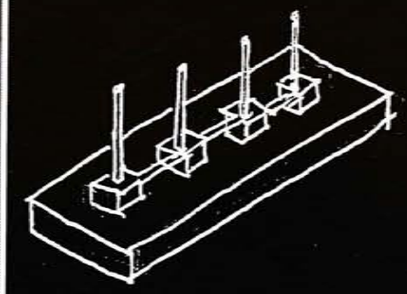
FINAL PRODUCT





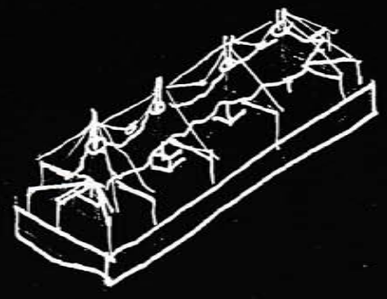
THE EDGE OF THE TENT ARE FIXED AND TENSION TO THE EDGE OF THE HORIZONTAL MEMBERS

SEQUENCE 4



THE MAIN MASTS ARE FIXED IN PLACE AT 16m CENTRE TO CENTRE GRID

SEQUENCE 7

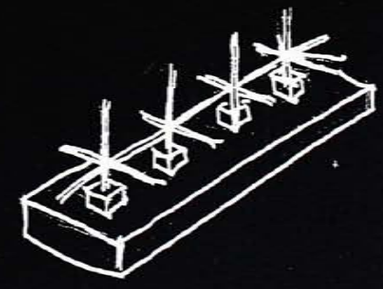


THE TENSION MEMBERS ARE TIED BETWEEN THE COMPRESSION MEMBERS

SEQUENCE 6

THE TENT AND THE PICK UP RING ARE PLACED AND FIXED TO THE MAIN MAST WITHOUT TENSION

SEQUENCE 5

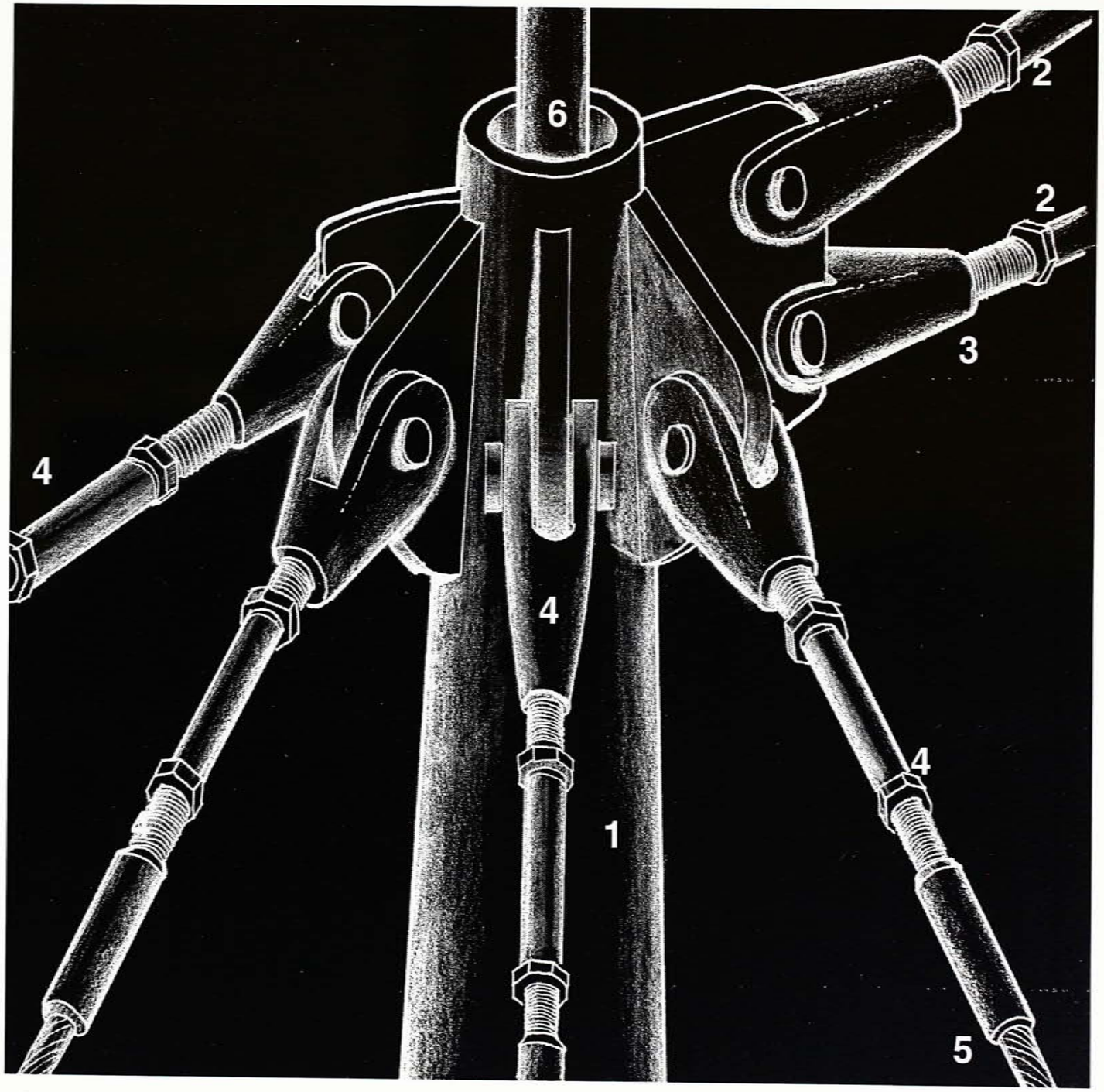


HORIZONTAL COMPRESSION MEMBERS ARE JOINTED TO THE MAIN MAST

3.3A
JOINTING DETAIL

AXONOMERTIC DETAIL OF MAIN BOOM TOP 1:5

1. 300 mm DIA. CHS PAINTED STEEL ROOF SUPPORT COLUMN AT 16m CENTRE TO CENTRE
2. IN-BETWEEN MAST-TOP TIE CABLE
3. ROOF PICK UP CABLE
4. MAST-TOP HORIZONTAL BOOM TIE CABLE
5. 20 mm DIA. CABLE
6. 100mm DIA. FLAG POLE

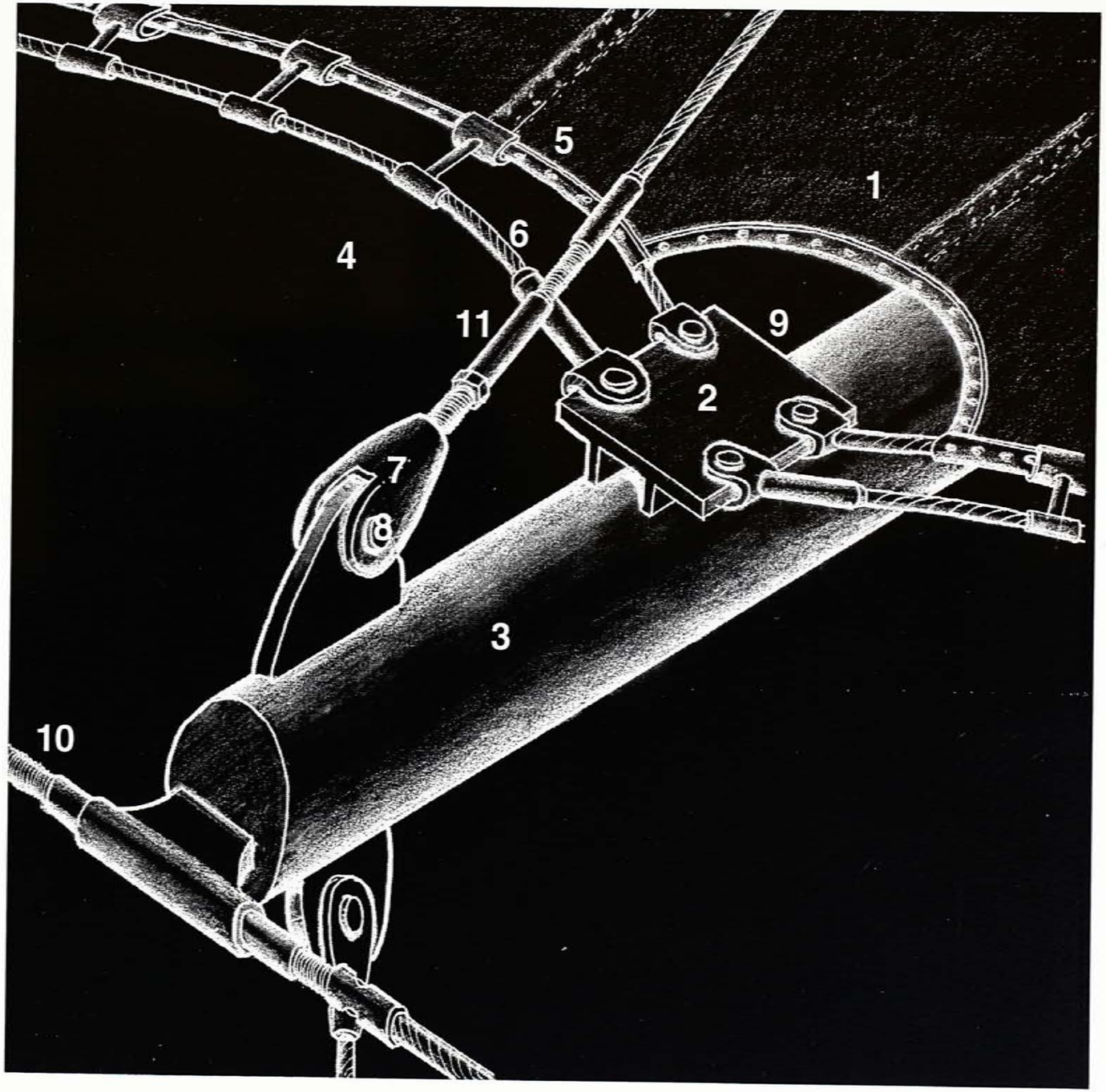


STRUCTURE AND SERVICES

3.3B
JOINTING DETAIL

AXONOMETRIC DETAIL OF FABRIC ROOF EDGE 1:5

1. TRANSLUSCENT TELFON COATED POLYESTER FABRIC WITH PVDF TOP COAT
2. FABRIC PERIMETER FIXING ASSEMBLY
3. 210mm DIA. CHS PAINTED STEEL ROOF SUPPORT HORIZONTAL BOOM
4. FREE FORM ROOF EDGE CABLE
5. GALV. STEEL TRANSVERSE CABLE FIXED AT ENDS TO MAIN CATENARY
6. GALV. STEEL END FITTING TO CABLE
7. GALV. STEEL CABLE TERMINATION
8. RETAINING CAP OVER PIN AND BEARING
9. 65mm WIDE ALUMINUM EXTRUSIONS ENCL. EDGE OF MEMBRANE IN 500mm MAX.
10. IN-BETWEEN HORIZONTAL-BOOM TIE UP CABLE
11. MAST-TOP-HORIZONTAL-BOOM TIE-UP CABLE



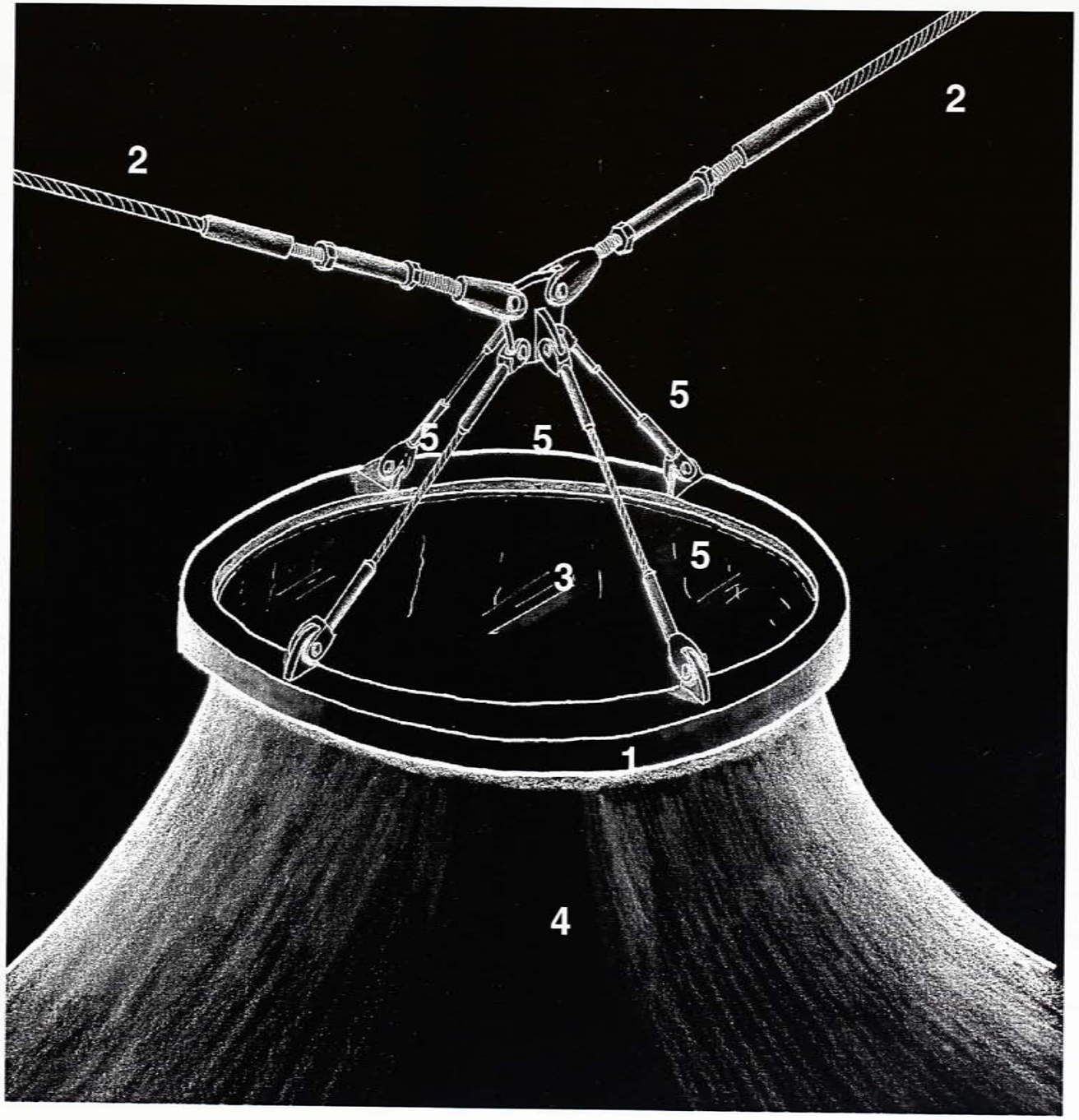
STRUCTURE AND SERVICES

3.3C
JOINTING DETAIL

AXONOMETRIC DETAIL OF ROOF PICK UP RING 1:10

1. PAINTED STEEL PICK-UP RING SUSPENDED BY GALV. STEEL CABLES.
2. 20mm DIA. ROOF PICK UP CABLE
3. 1.5m DIA. 10mm THICK TOUGHENED GLASS DISK
4. TRANSLUSCENT FABRIC
5. 4X10mm DIA. CABLES SUPPORTING THE STEEL RING

STRUCTURE AND SERVICES



3.4 HULL STRUCTURE

1. STRUCTURAL MODULE

IS COMPOSED OF STEEL FRAMEWORK WITH 600X500X600 GRID. EACH PLATE HAS A HOLE TO REDUCE THE USAGE OF MATERIALS

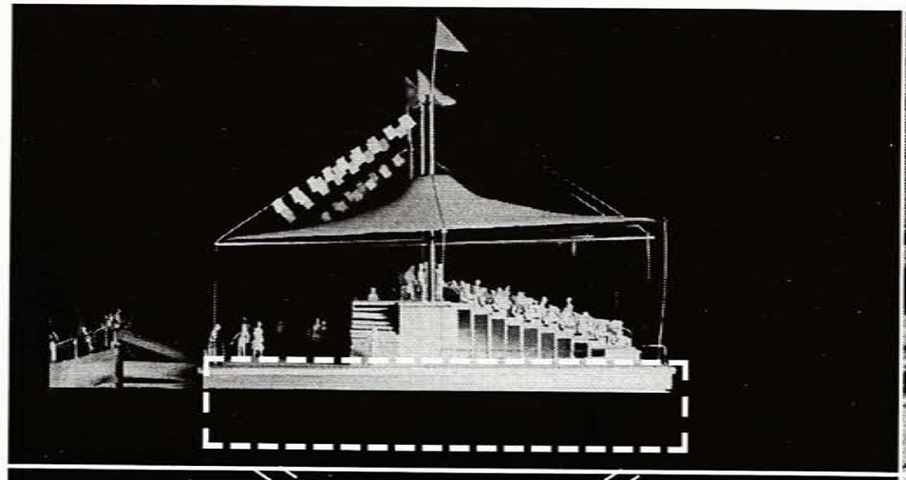
2. JOINTING

THE PIECES ONE BY ONE BY WELDING. THE SECTION INCLUDE SEMICIRCULAR HOLES, CUT BY TORCHES IN THE PLATE SHOP, ARE FOR DRAINAGE

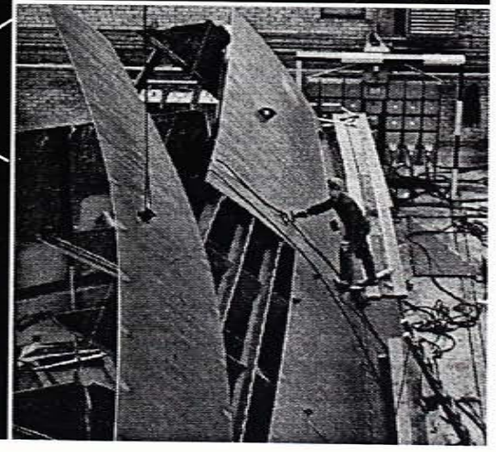
3. SKIN OF HULL

THE STEEL PLATES FORMS THE SKIN OF THE HULL ARE LOWERED AND AGLINED BEFORE BEING WELDED TO THE UPSIDE-DOWN FRAMEWORK

STRUCTURE AND SERVICES



AXONOMETRIC SHOWING HULL STRUCTURE



3.5 RETRACTABLE SEATING

1. ORIGINAL POSITION

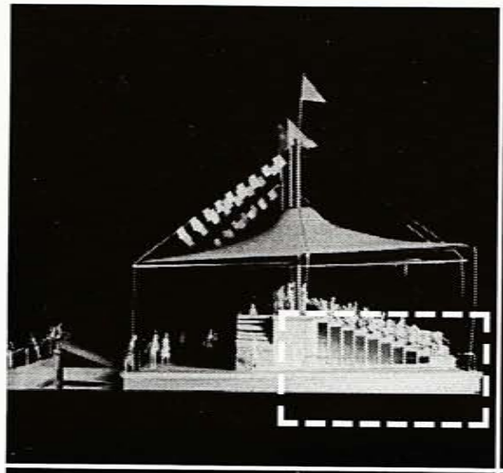
The seats are originally stored inside the hydraulic jet pit inside the hull.

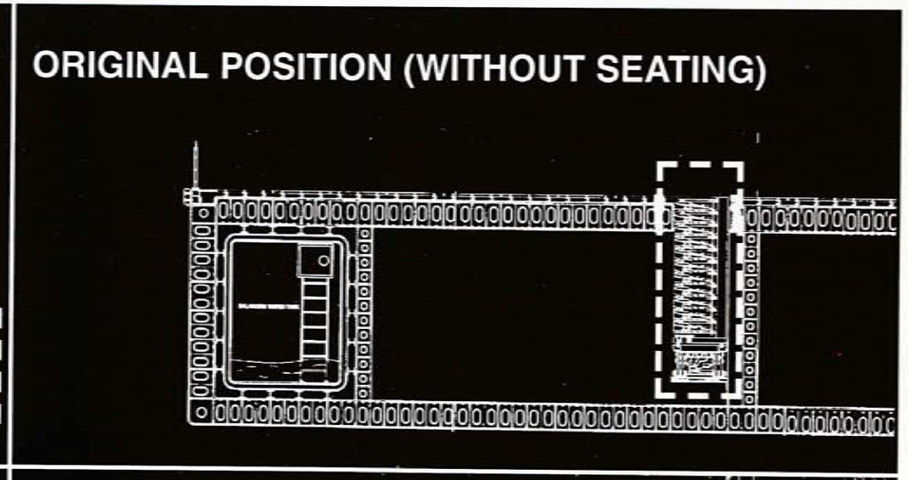
2. TRANSITION POSITION

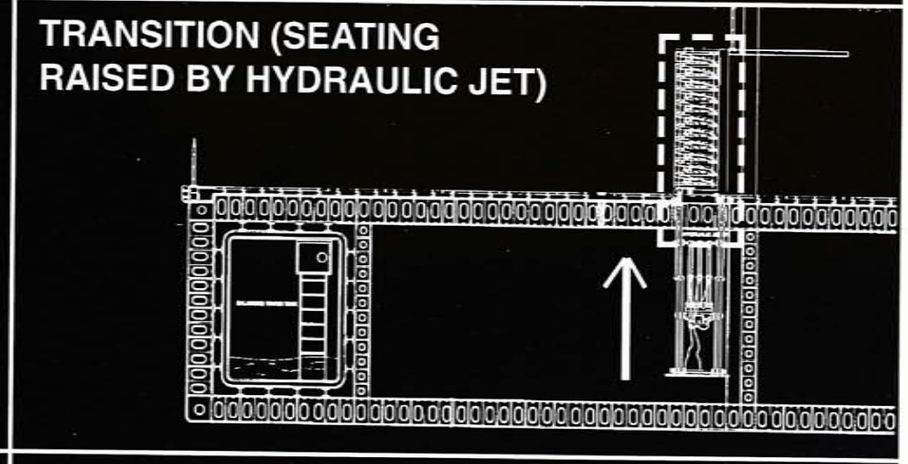
When the seating area needs to be used, the hydraulic jet will raised the compacted seating platforms onto the ground floor. This step is controlled in the remote control room in the basement floor inside the hull.

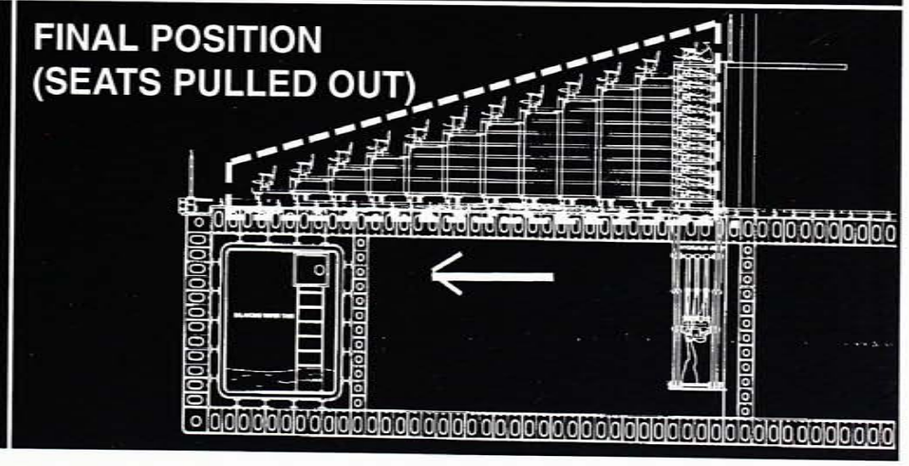
3. FINAL POSITION

After the compacted seating area is raised, it can be pulled out one row by one row to form the stepped platform. Then individual seat backs can be flipped to the vertical position.









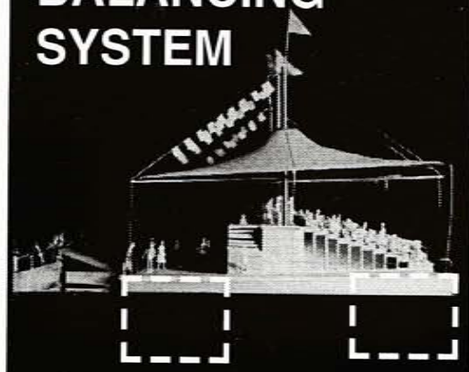
3.6 BALANCING SYSTEM

The balancing system of the hull includes two balancing water tanks at both sides in the cross section. It also includes a central water tank at the middle part of the hull.

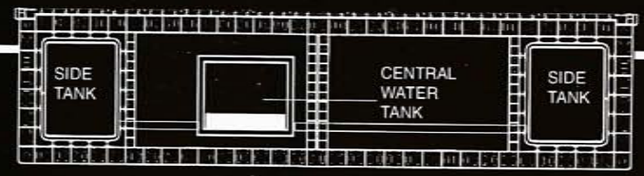
When sea wave or imbalance of weight cause the hull to turn the hull anti-clockwise, the turning of the hull stimulates the sensor installed inside the hull. Then sea water tank will be pumped into the water tank at the right. The same situation will be applied to the opposite condition.

STRUCTURE AND SERVICES

BALANCING SYSTEM

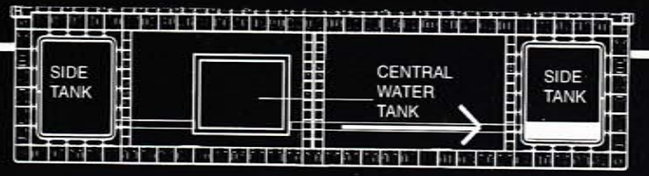


ORIGINAL POSITION (EQUILIBRIUM)



EXTERNAL FORCE TURNS THE HULL

WATER RE-BALANCE THE HULL

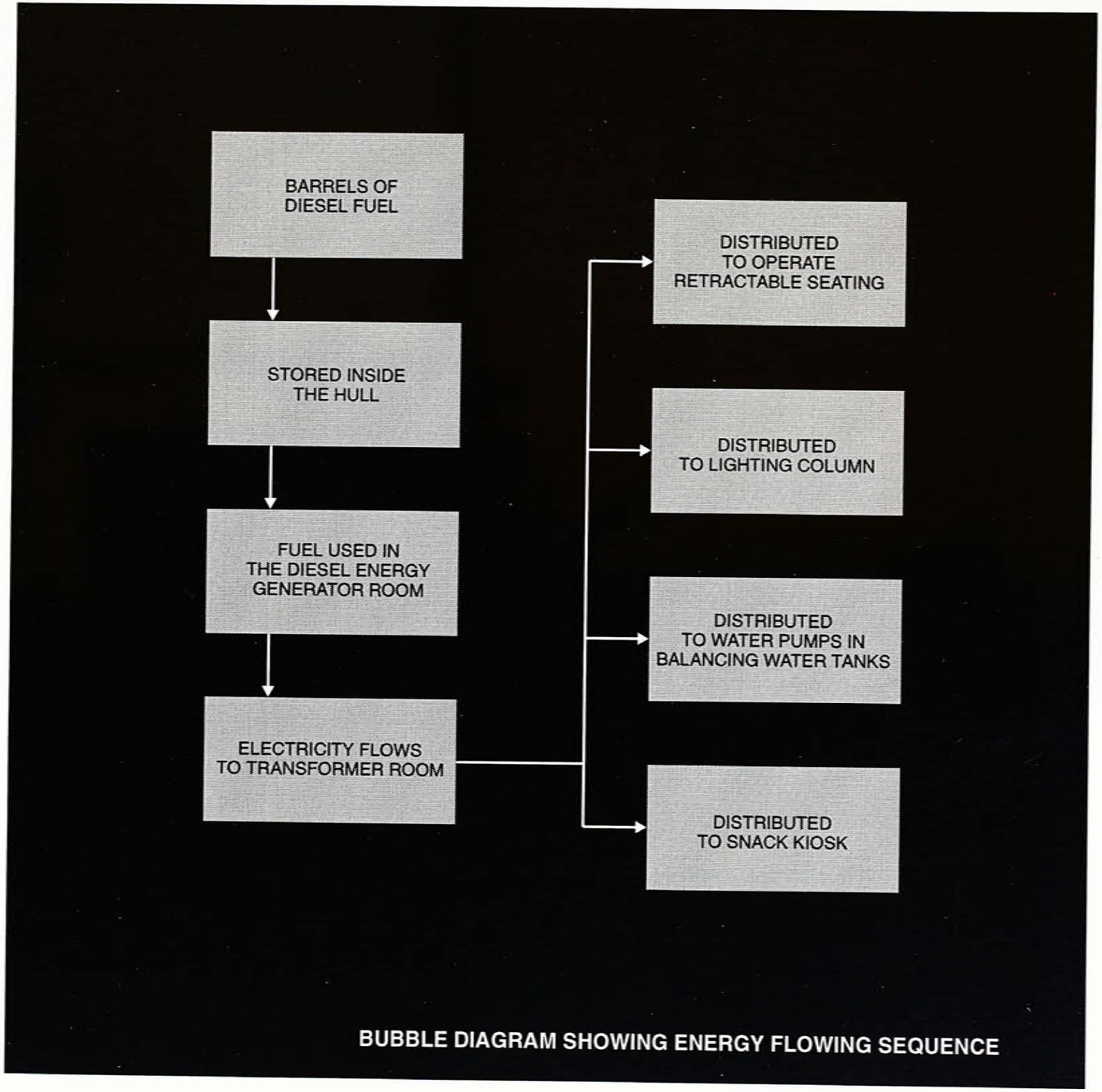


3.7 POWER AND ENERGY

The power source of this building is different as normal buildings because there are no connections of power cables to this building. Therefore, it needs to be self-sufficient like a boat. The energy source is come from barrels of diesel fuel and stored inside the storage area inside the hull.

The diesel fuel are then used in the diesel electricity generator room to transform into electricity. It is then transferred into transformer room and distributed to the placed where electricity is needed.

As there are no air conditioning system in this building, the energy consumption rate in this building is not very high.



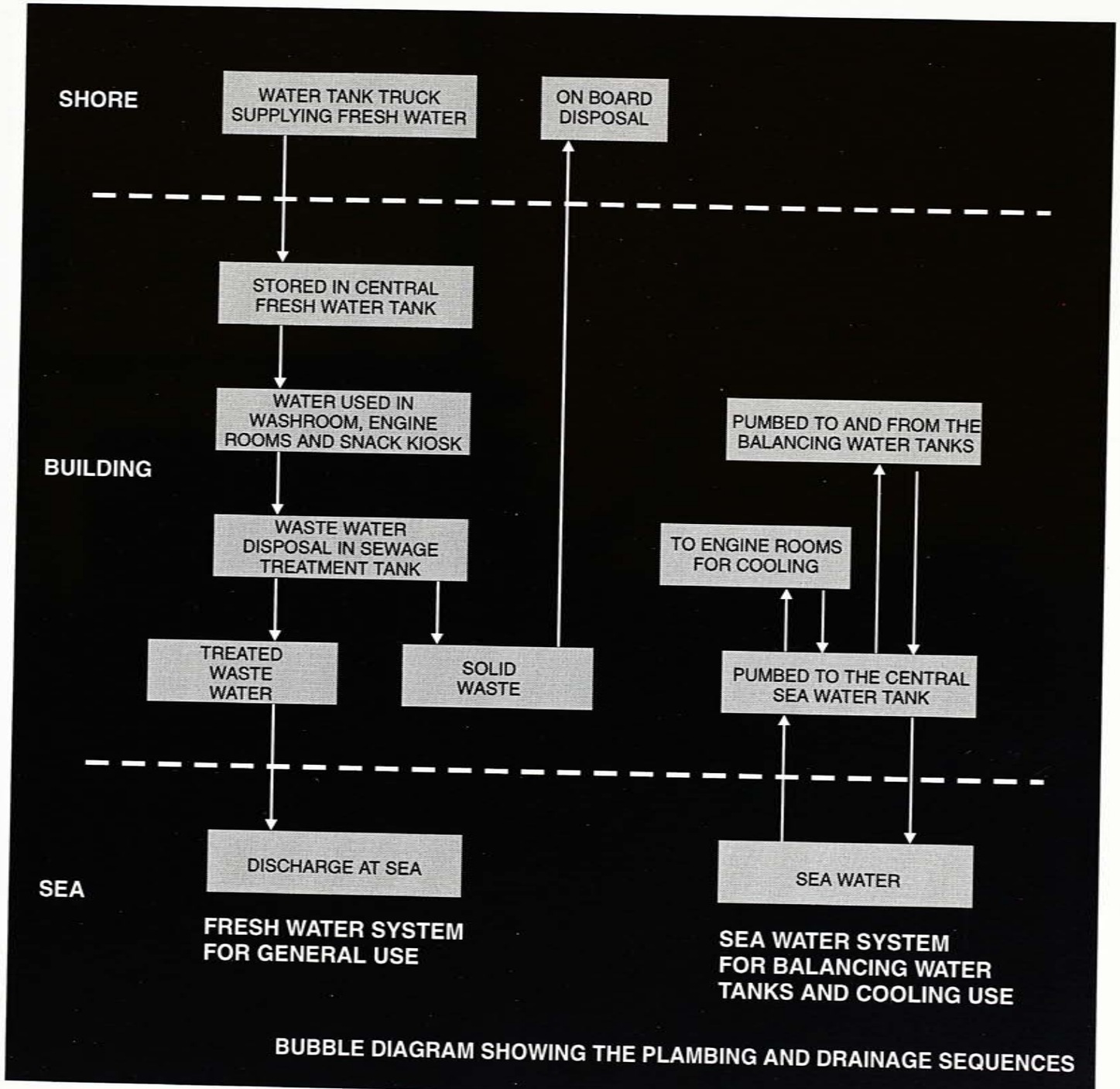
BUBBLE DIAGRAM SHOWING ENERGY FLOWING SEQUENCE

3.8 PLUMBING AND DRAINAGE

The drainage of this building is rather simple, which only include the roof and deck drainage. As the roof is a tensile structure, the roof drainage works by its form nature. The deck drainage locates at the periphery of the deck in which there is a 1:100 fall of the deck for water at the deck to fall to the drainage duct and discharge to the sea.

The plumbing of the building is not as usual as normal buildings because there are no water pipes connecting to the building. Basically, fresh water supply are by water tank trucks and stored inside the hull and distributed for usage. The water used in balancing water tanks are sea water that are directed pumped aside and used after filtering. The sewage are stored inside sewage treatment tanks and liquid sewage are treated before discharged into the sea where the solid sewage are disposed on board.

STRUCTURE AND SERVICES



BUBBLE DIAGRAM SHOWING THE PLAMBING AND DRAINAGE SEQUENCES

3.9
LIFE SAFETY

FIRE HAZARD

The fire hazard of this building is extremely low, with more than 95% occupant spaces outdoor, except washrooms and snack kiosks. However, there will be fire extinguisher installed for fire fighting purposes.

MEANS OF ESCAPE

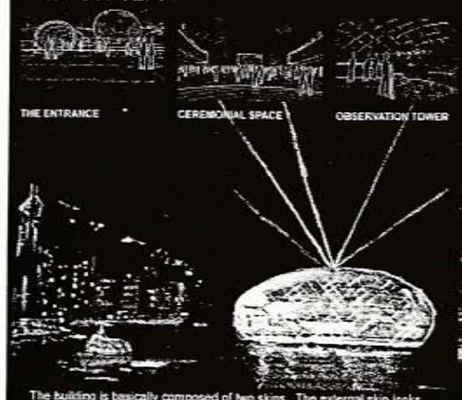
As this is not a normal building, the normal fire regulation does not apply. However, the means of escape is more like a ship. There will be emergency life saving boats stored inside the hull which can be used for emergency escape.

STRUCTURE AND SERVICES

4

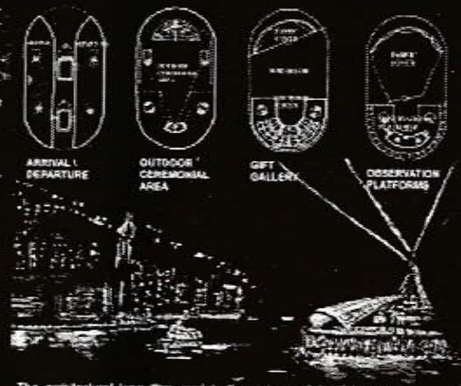
DESIGN PROCESS

FIRST CONCEPT



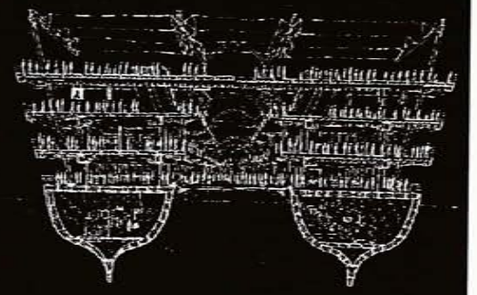
The building is basically composed of two skins. The external skin looks like a water droplet. This skin is openable so that the internal spaces can be made exterior.

CHANGING IMAGE



The architectural language used is the water and the fabric sail. Water is used as the elevation of the buildings and the fabric sail is used to create a ship image.

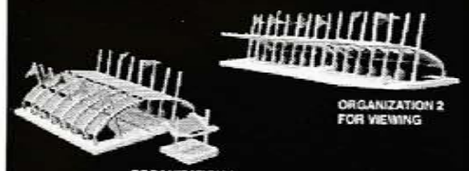
TWO BLOCKS WITH ATRIUM



SECTIONAL PERSPECTIVE

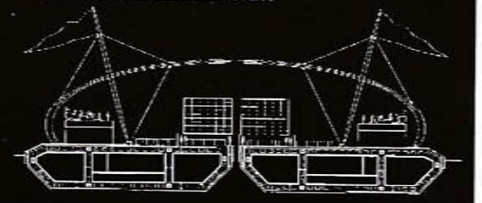
From the second to the third presentation, the effort is paid to develop the scheme to make everything work. For example, the structural systems, the details of the roof, the construction and framing of the building etc.

FROM ONE TO TWO

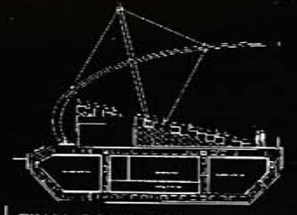


From the third presentation, the critics argues the approach of the project is too imagery. Then the project is now developed into more functional oriented, with one form split into two forms and organized flexibly according to functions.

TWO MAIN ORGANIZATION



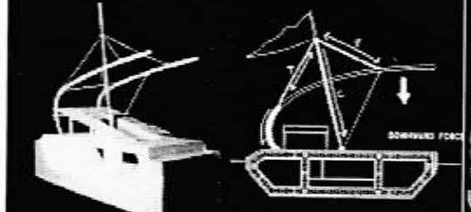
TWO BARGES COMBINING

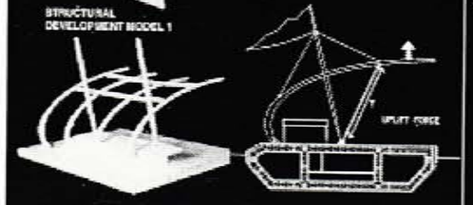


INDIVIDUAL BARGE

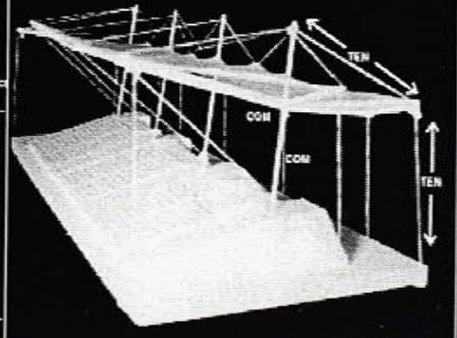
THE PROJECT CONTINUING DEVELOPING INTO THIS DIRECTION WITH THE TWO MAIN SECTION CONSIDERED

STRUCTURAL STUDIES



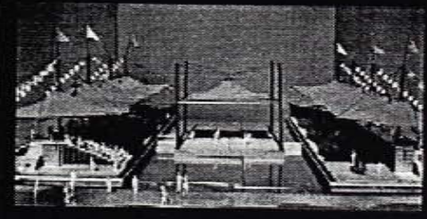


STRUCTURAL PURIFICATION



STRUCTURAL DEVELOPMENT MODEL 3
PURIFICATION OF COMPRESSION AND TENSION MEMBERS

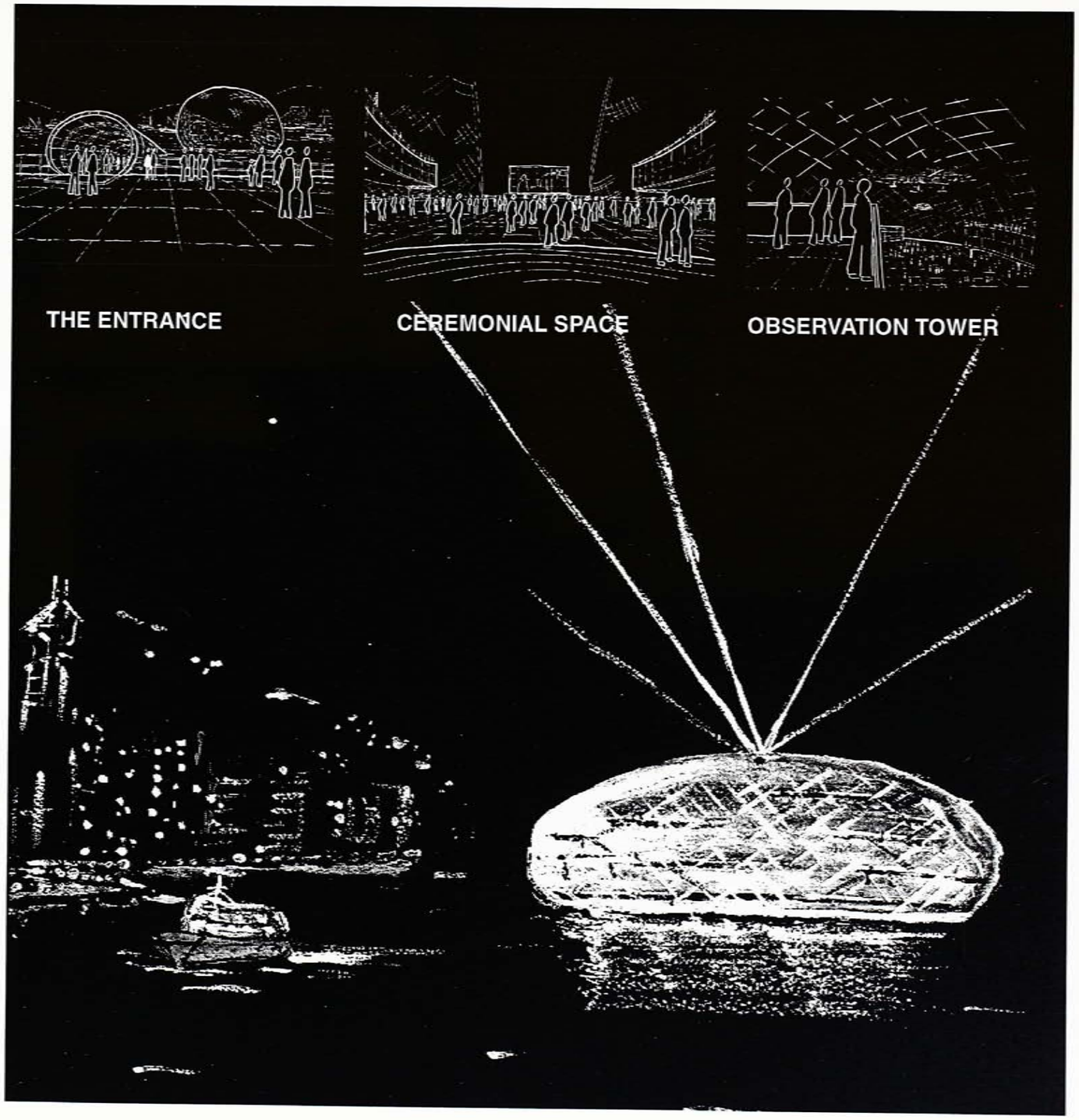
FINAL SOLUTION



The final soution is with two components of floating barges and one performance stage. The roof is using pure tensile fabric structure with CHS compression members.

4.1
FIRST CONCEPT

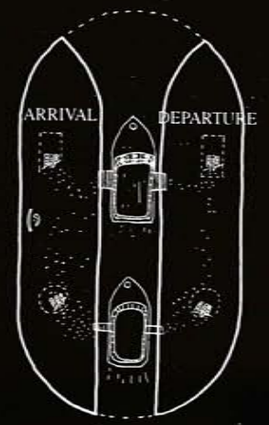
The building is basically composed of two skins. The external skin looks like a water droplet. This skin is openable so that the internal spaces can be made exterior.



DESIGN PROCESS

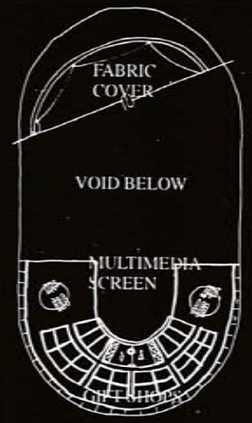
4.2
CHANGING IMAGE

The architectural language used is the water and the fabric sail. Water is used as the elevation of the buildings and the fabric sail is used to create a ship image.



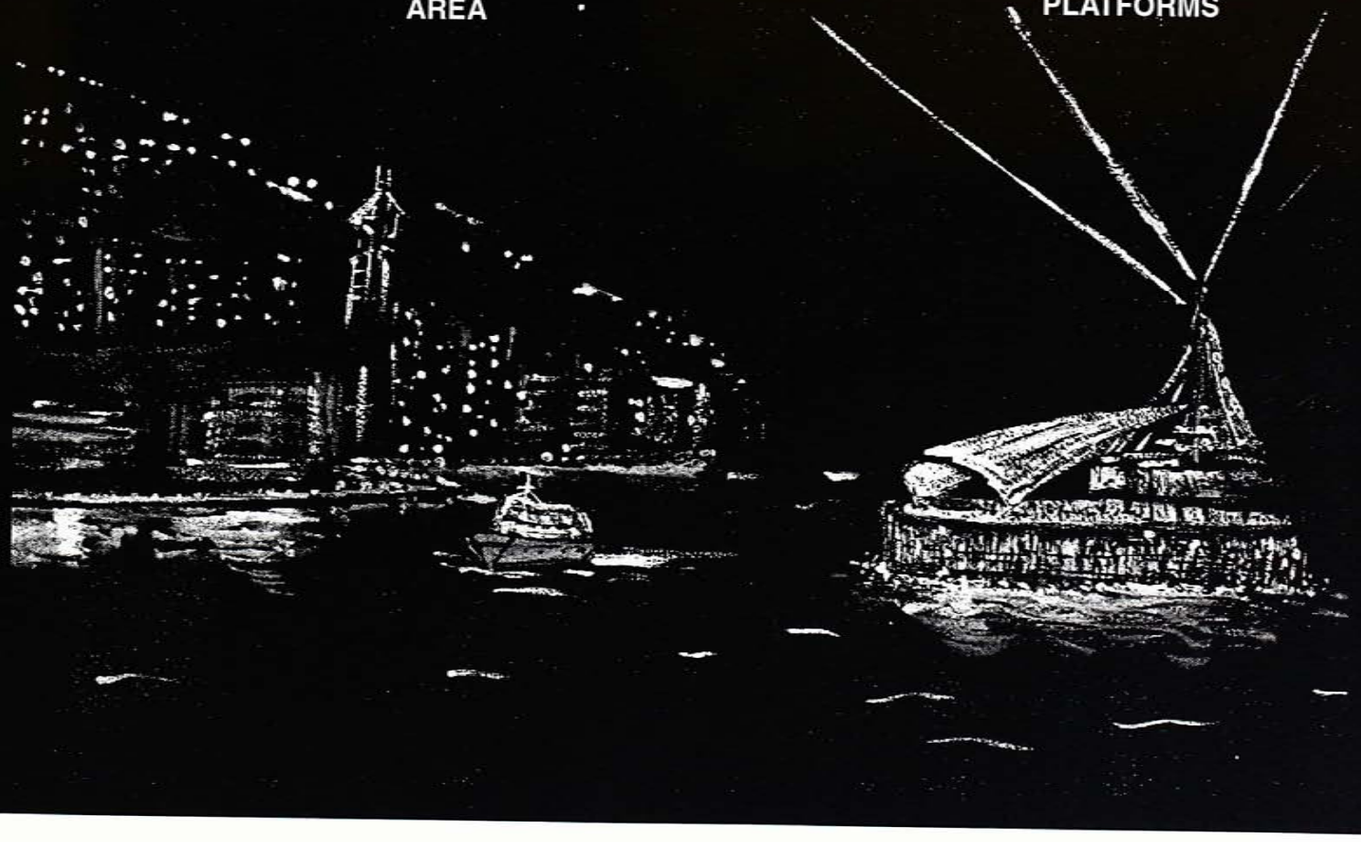
ARRIVAL \
DEPARTURE

OUTDOOR
CEREMONIAL
AREA



GIFT
GALLERY

OBSERVATION
PLATFORMS

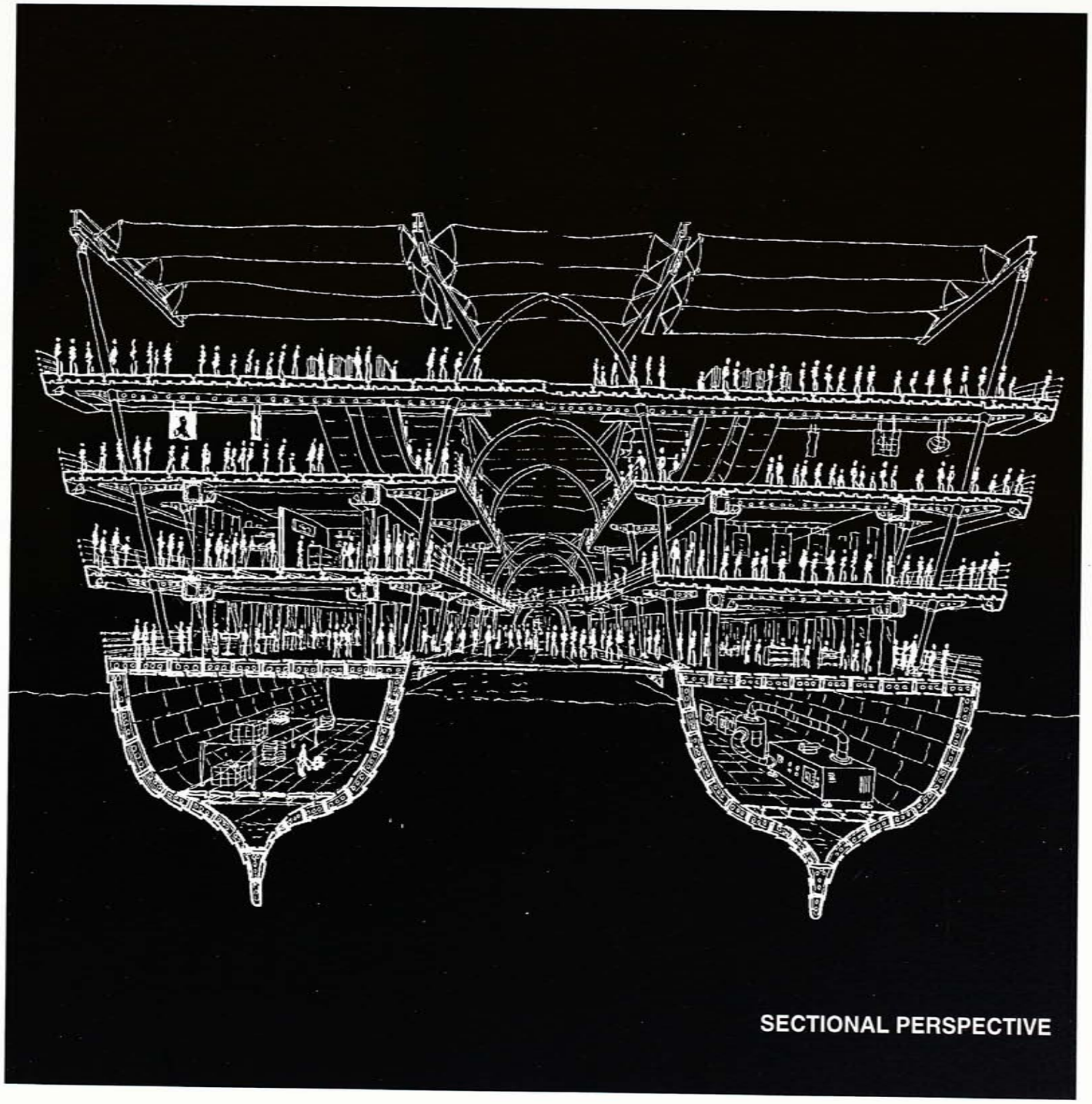


DESIGN PROCESS

4.3
TWO BLOCKS WITH ATRIUM

From the second to the third presentation, the effort has been paid to develop the scheme to make everything work. For example, the structural systems, the details of the roof, the construction and framing of the building by refering to similar shipbuilding technologies and methodologies.

DESIGN PROCESS

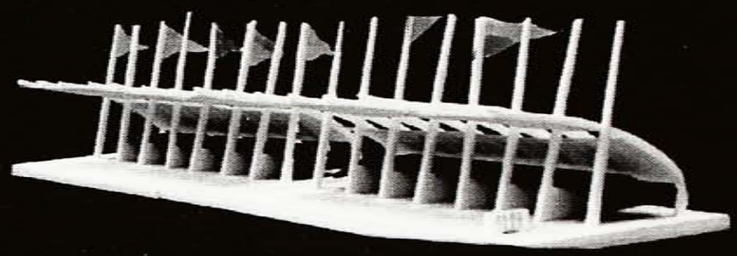


SECTIONAL PERSPECTIVE

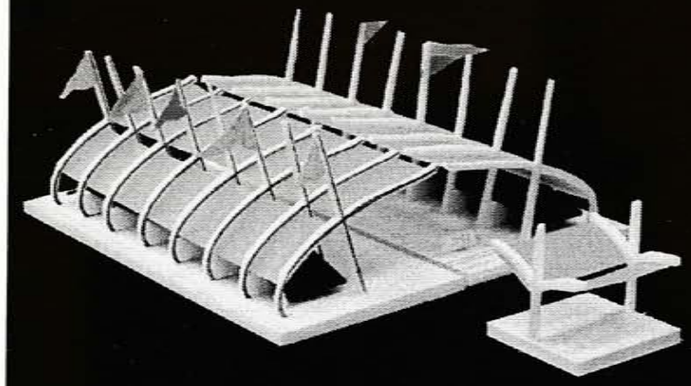
4.4
FROM ONE TO TWO

In the third presentation, the approach of the project is too imagery. Design is done in a subjective way. It lacks some concrete function behind the architecture. Then the project is now developed into more functional oriented, with one form split into two forms and organized flexibly according to functions.

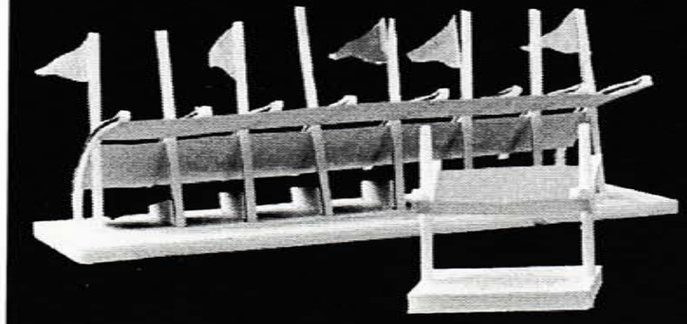
DESIGN PROCESS

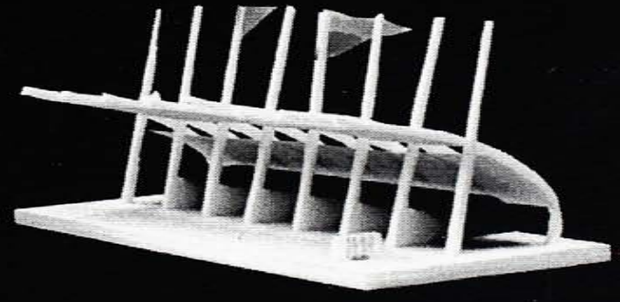


ORGANIZATION 2
FOR VIEWING



ORGANIZATION 1
FOR EXHIBITION



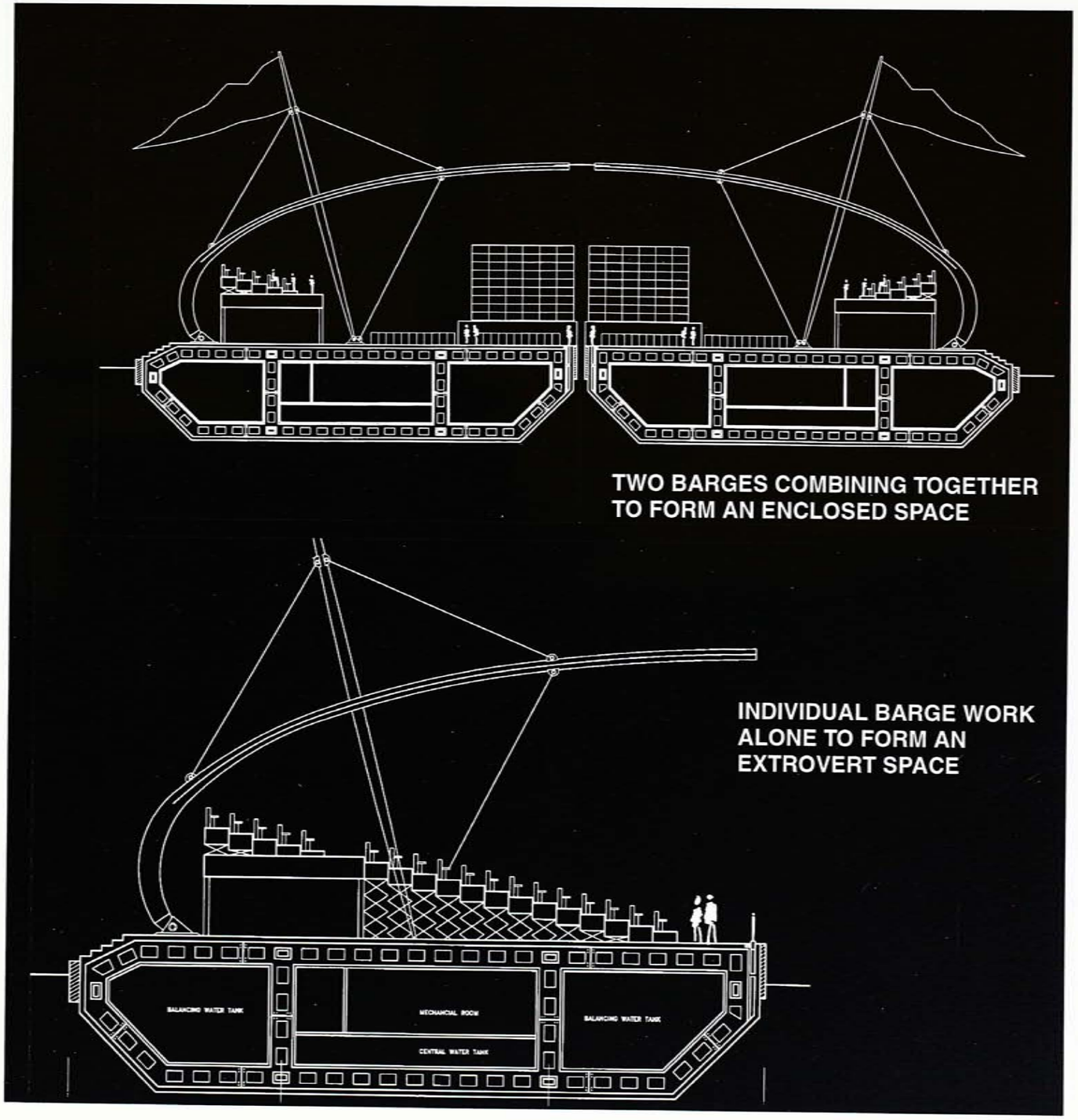


ORGANIZATION 3
FOR THEATRE

4.5 FLEXIBLE ORGANIZATION

The project continues to develop in this direction to work for the objective that different combinations of the floating structure can be make flexible for different uses of the building. Now, the organization seems to be more practical with more defined function and form follows what function is. However, the structure is not so pure yet for the final solution since there seems to have two different systems of structural systems.

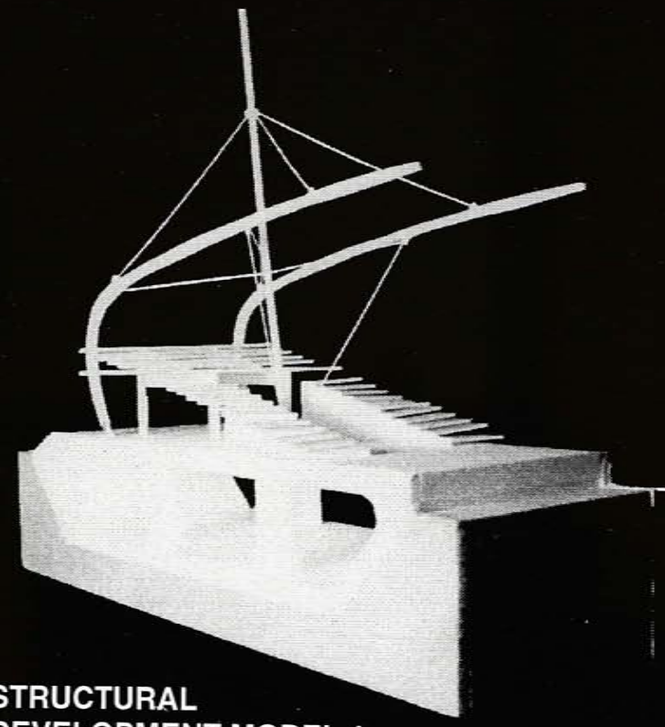
DESIGN PROCESS



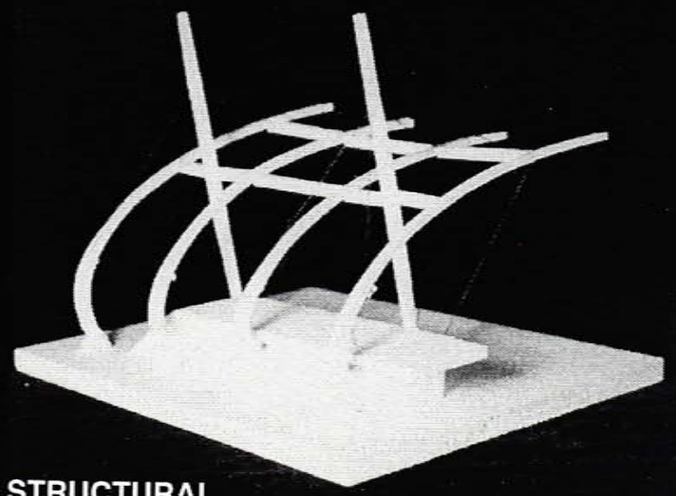
4.6 STRUCTURAL STUDIES

After the determination of the general building form, the design proceed to study the structure. The use of structural system is like a grand stand. There is a vertical main mast and there is a horizontal rigid frame. There are cables connecting between the vertival and the horizontal structure.

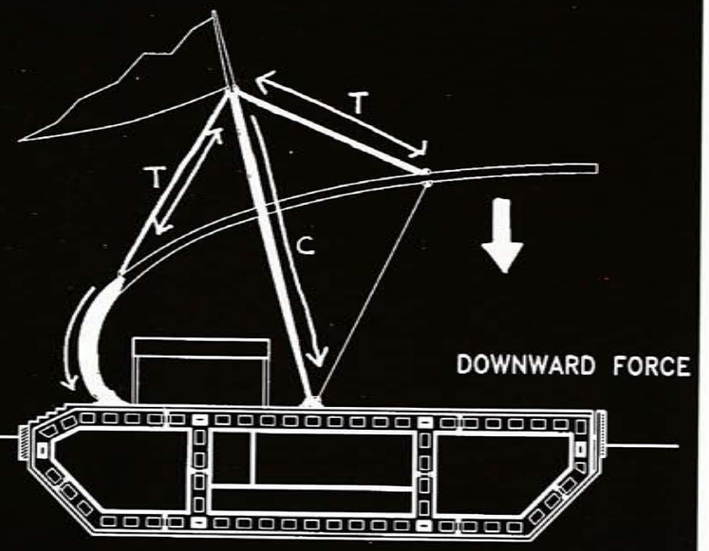
DESIGN PROCESS

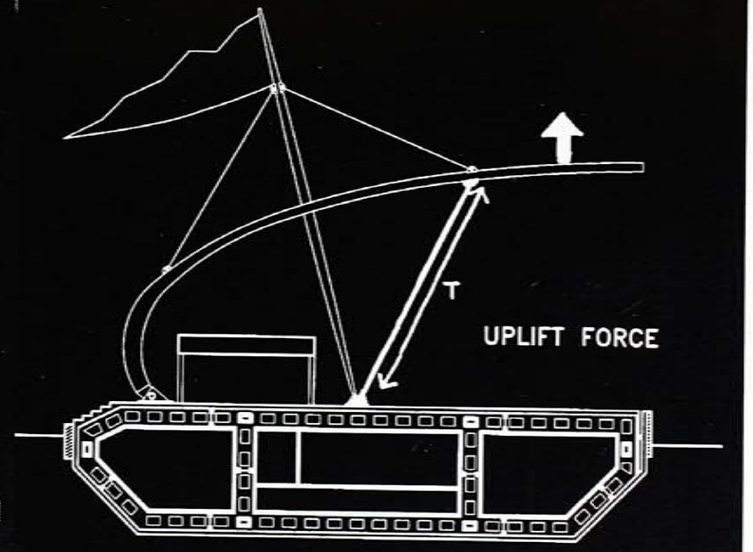


STRUCTURAL
DEVELOPMENT MODEL 1



STRUCTURAL
DEVELOPMENT MODEL 2





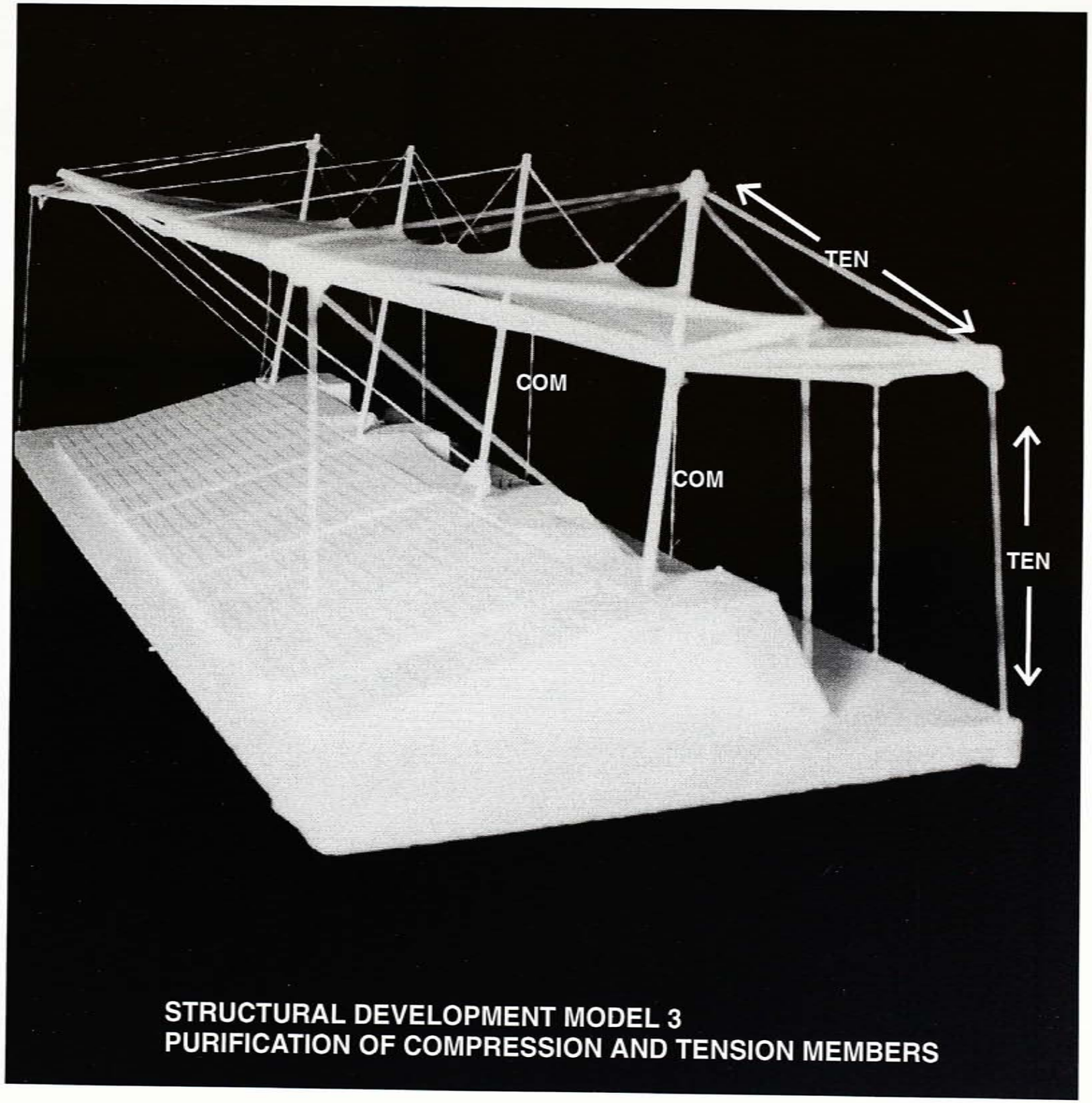
FORCE STUDY

4.7 STRUCTURAL PURIFICATIONS

Changes are made to purify the structural members and now the changes are now shown in the model on the right.

The structural main mast is still unchanged and the horizontal curve member is changed to straight ones. tension cables are connecting between the ends of each compression members.

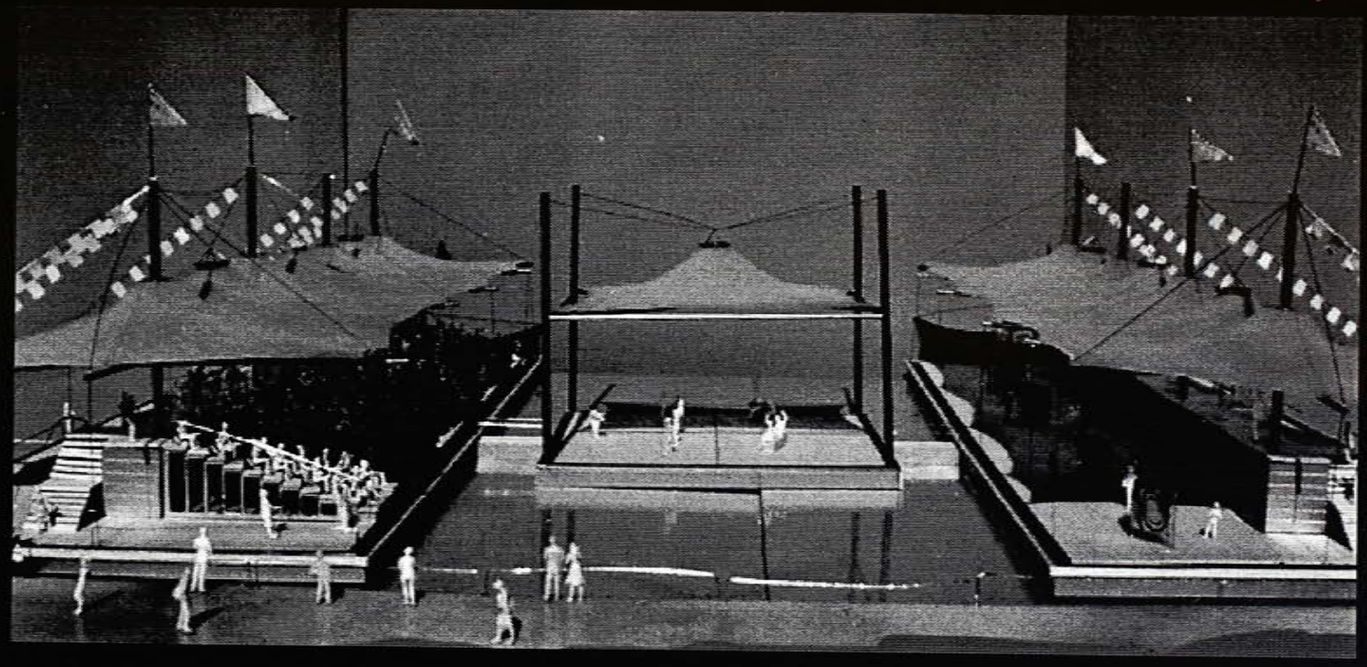
DESIGN PROCESS



STRUCTURAL DEVELOPMENT MODEL 3
PURIFICATION OF COMPRESSION AND TENSION MEMBERS

4.8
FINAL SOLUTION

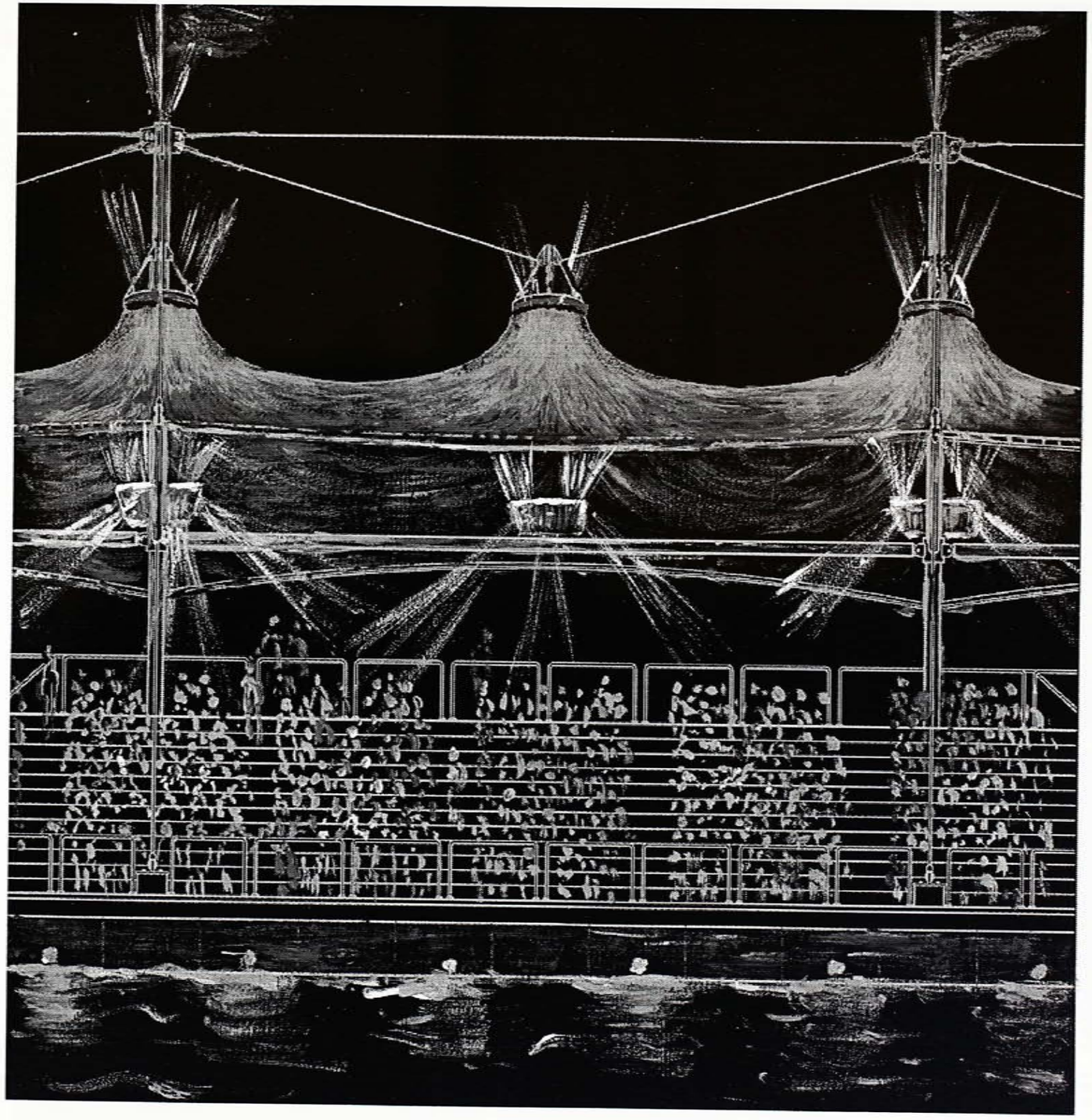
The final solution is shown at the right model photo. There are two floating structures and one performance stage. The organizat-ion of the structure depends on the function held. The roof is now in pure tensile form using steel CHS tubes as compression members.



DESIGN PROCESS

5

LIGHTING STUDIES

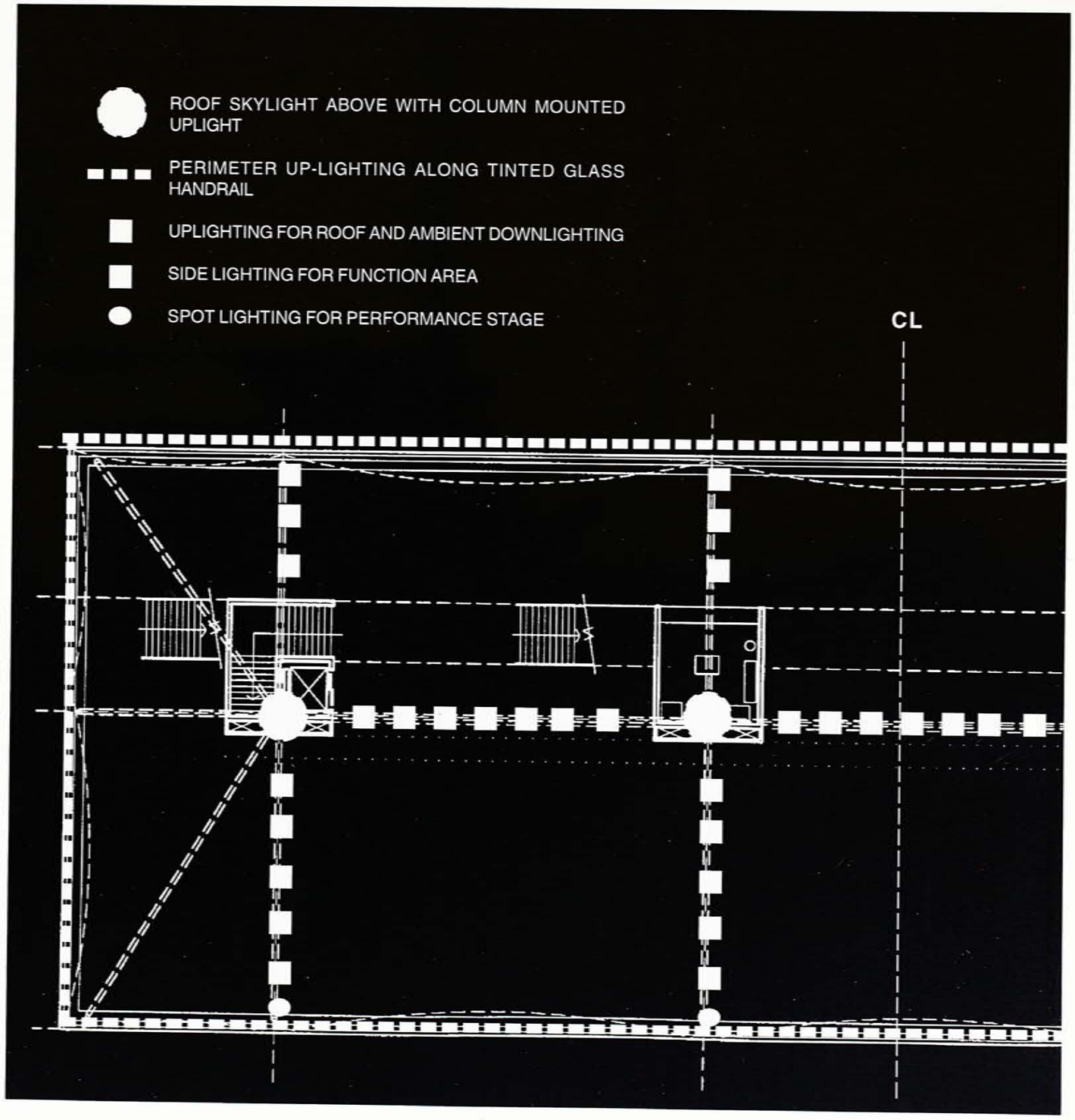


5.1 PLANNING FOR LIGHTING

There are a few different lighting systems for the whole structure.

Firstly, there is a periphery side lighting that can light up the water surface. Then there is a lighting module at the middle of the main mast that includes uplighting and side lighting. Thirdly, there are also up floodlighting at the handrails for ambient lighting for the users.

SPECIAL STUDY ON LIGHTING

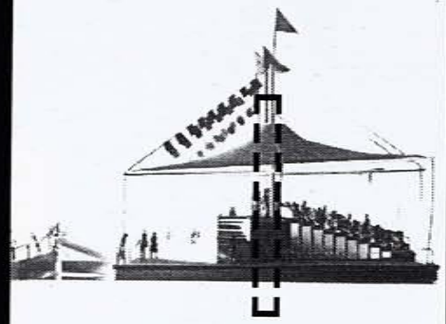


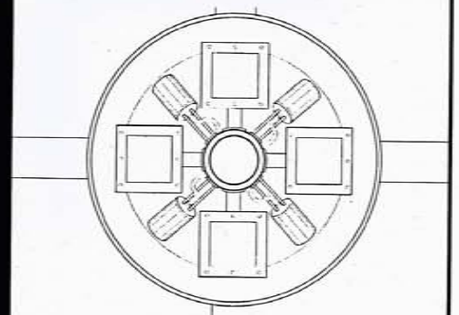
5.2 LIGHTING COLUMN

The lighting design of the structure mainly depends on uplighting at the columns. There is a lighting fixture that is integrated with uplighting and downlighting and also the signage. The uplighting is used to light up the tent and the main mast at nighttime. The lighting chosen is a powerdisc that will be described later.

The downlight and sidelight used is hidro lighting. It is very small related to other types of lighting at the same level of power. The hidro light and the powerdisc are located at the main mast organized alternately. There is a transluscent lighting fixture surrounds the whole lighting system.

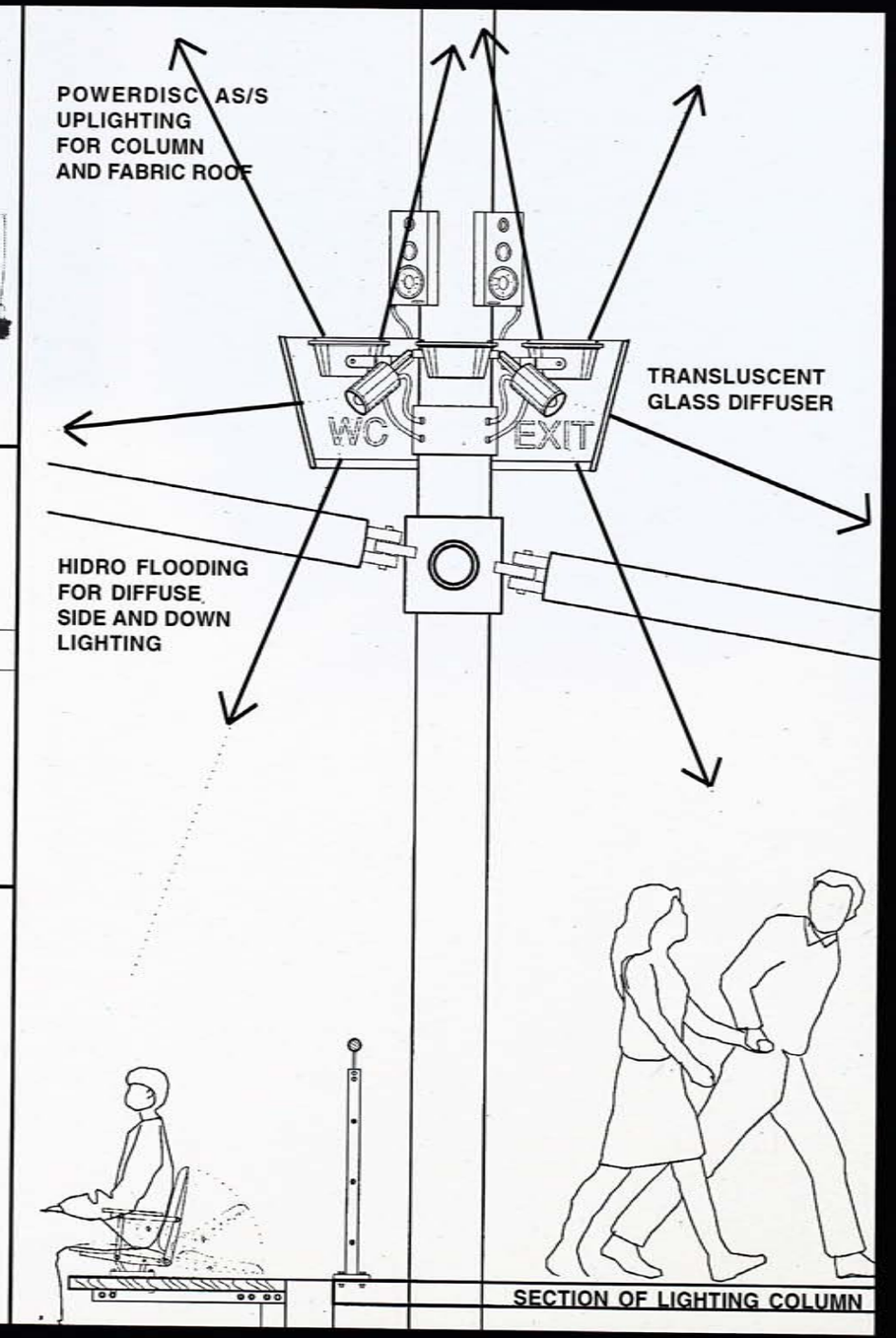
LIGHTING STUDY





PLAN OF LIGHTING COLUMN

DIRECTED UPLIGHTING FOR THE ROOF AND THE COLUMN IS DONE BY UPLIGHTS MOUNTED ON COLUMN ITSELF, THE SAME APPLIES TO THE DOWNLIGHING SYSTEM. TO AVOID GLARE TO THE USERS A TRANSLUSCENT GLASS SHEILD IS USED TO DIFFUSE THE DOWNLIGHT.



SECTION OF LIGHTING COLUMN

5.3 DAYLIGHTING AND ARTIFICIAL LIGHTING

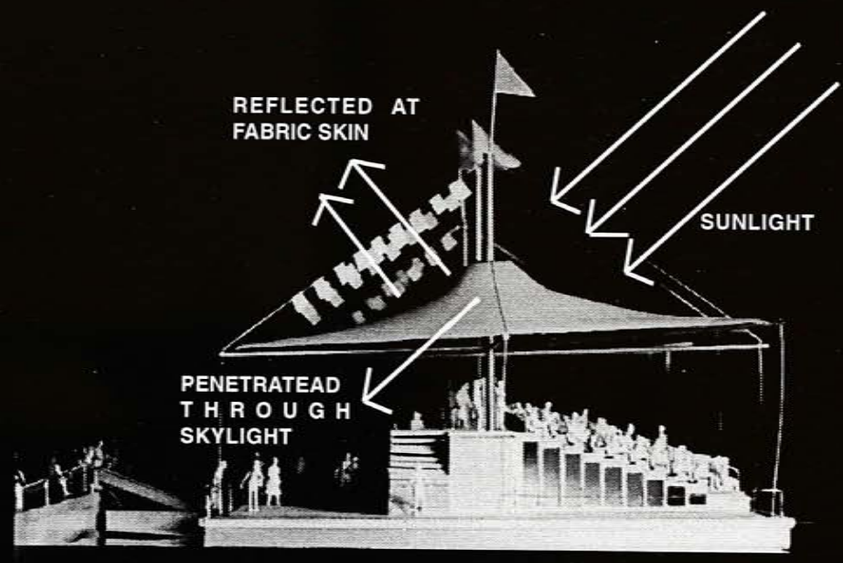
DAYTIME DAYLIGHTING

LIGHTING AT DAYTIME IS ENOUGH WITH DIFFUSE SUNLIGHT AND ADDITIONAL DIRECT SUNLIGHT IS SHADED BY TRANSLUSCENT FABRIC ROOF

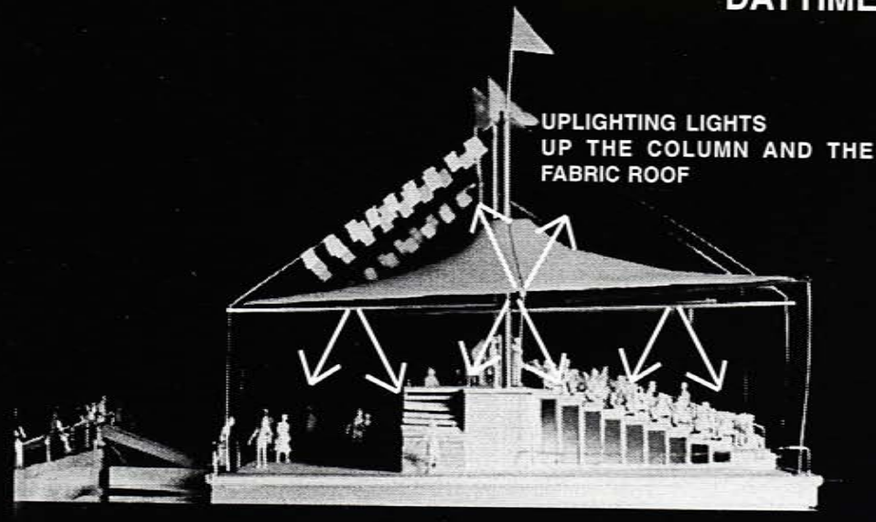
NIGHTTIME LIGHTING

ARTIFICIAL DOWNLIGHTING ALONG THE STRUCTURE TO PROVIDE ENOUGH LIGHTING TO GROUND SPACE

SPECIAL STUDY ON LIGHTING



DAYTIME DAYLIGHTING

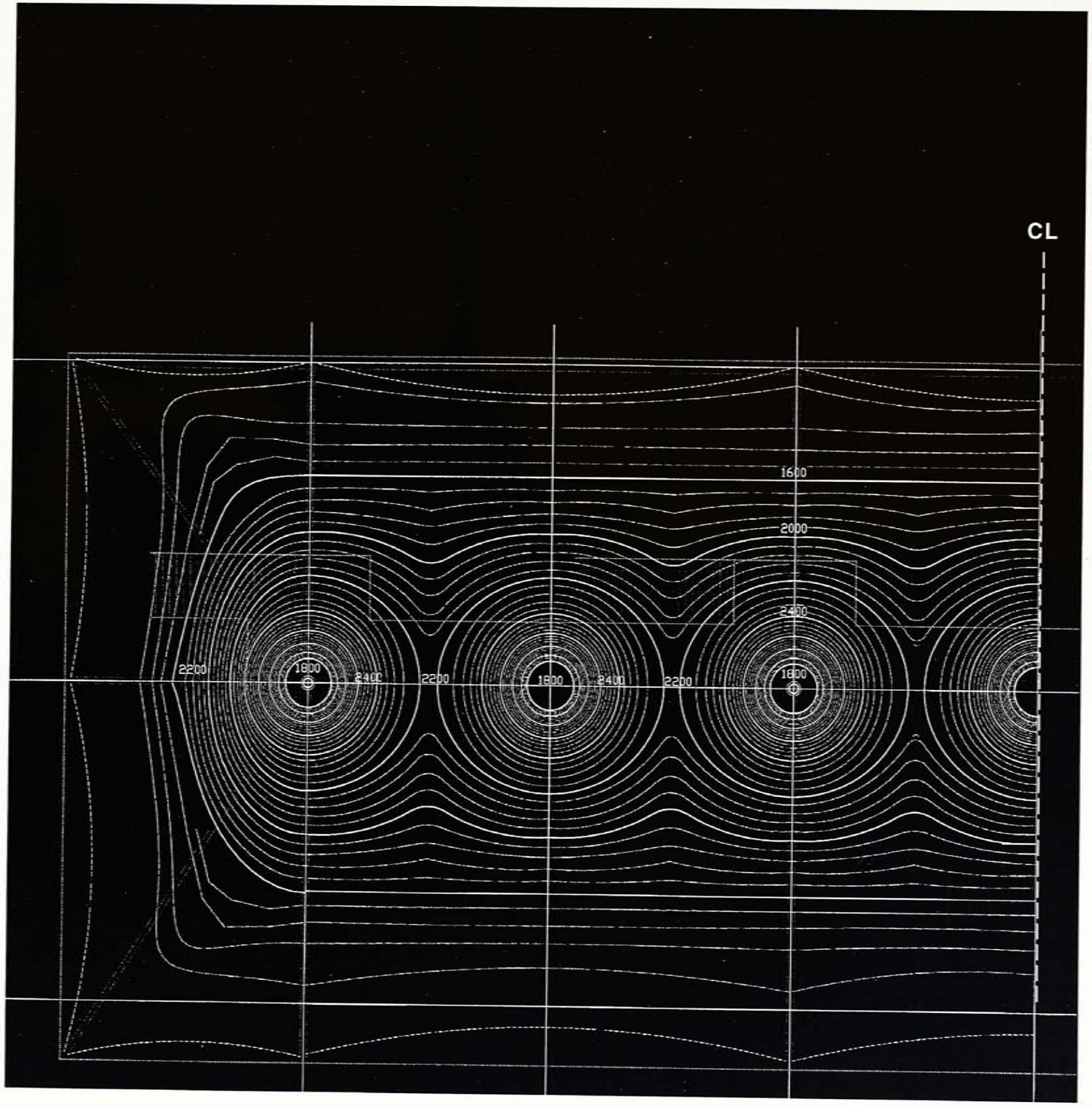


NIGHTTIME ARTIFICIAL LIGHTING

5.4
LUX LEVEL STUDY

The lux level study is a hypothetical analysis to estimate the amount of light at different points of the structure in plan. As the power of the light source and the specification of the lighting is estimated, we can estimate the distribution of lighting at the whole area. From the data specified, the highest lighting level of the structure is 2400 lux and dispersed to around 600 lux.

LIGHTING STUDY

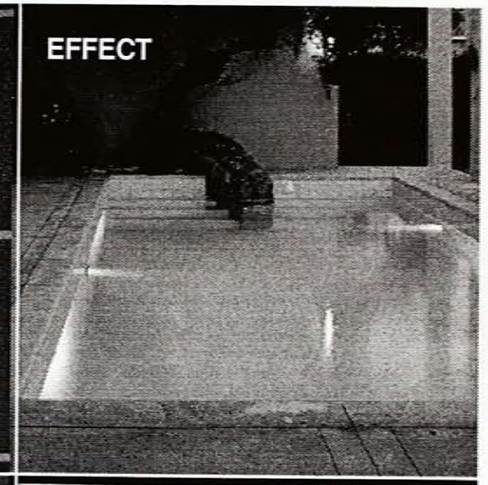


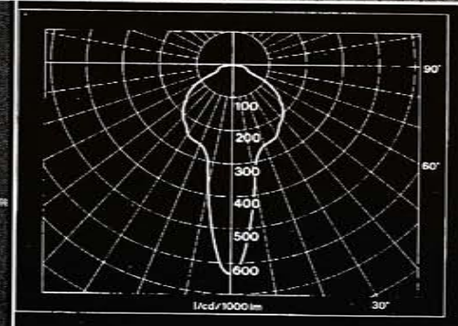
5.5 FLOODLIGHTING SPECIFICATION

Tarzan system is a complete installation set for underwater lighting, designed to offer the user all he needs in a single assembly kit.

As the structure is floating on water, the lighting is very important to show how it reflects on water. This kind of lighting is used to light up the water surface along the periphery.

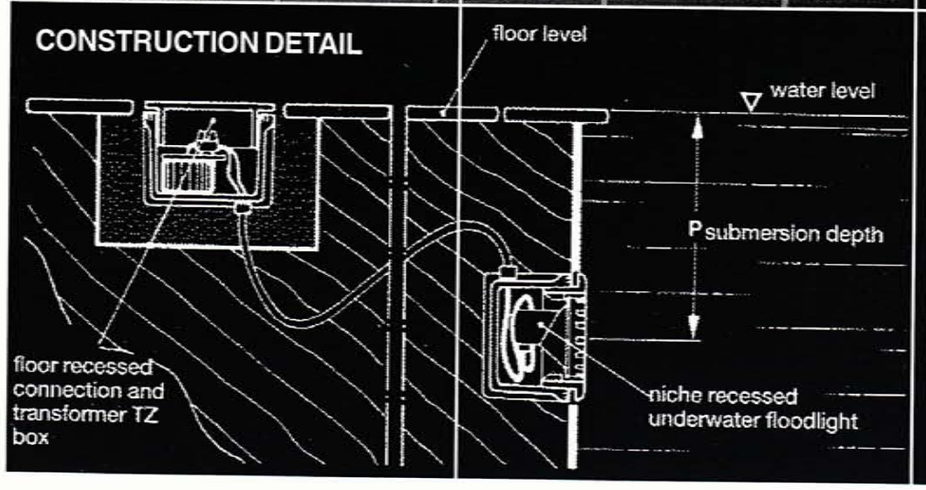
LIGHTING STUDIES

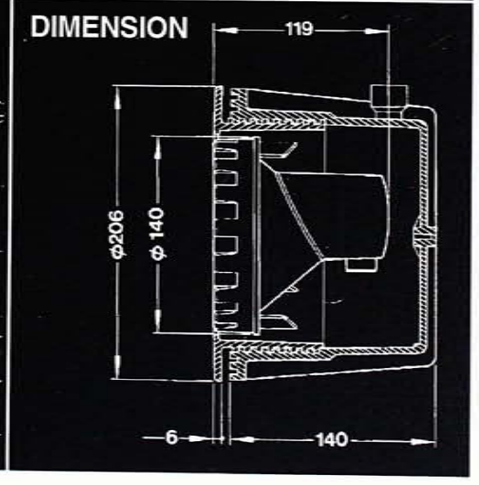




tarzan/P2-100

100W-12V-GY6,35 lamp
axial filament
polar distribution of luminous intensity
lamp flux reduced to 1000 lumen





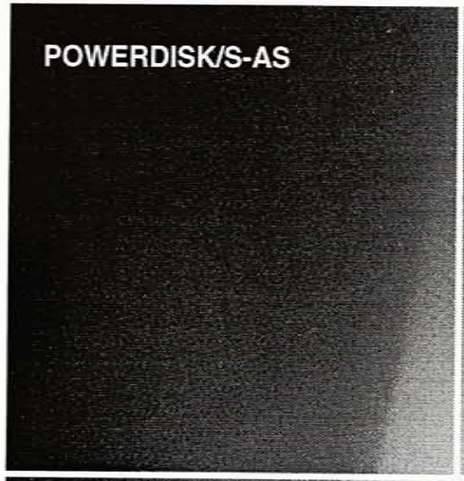
5.6 UPLIGHTING SPECIFICATION

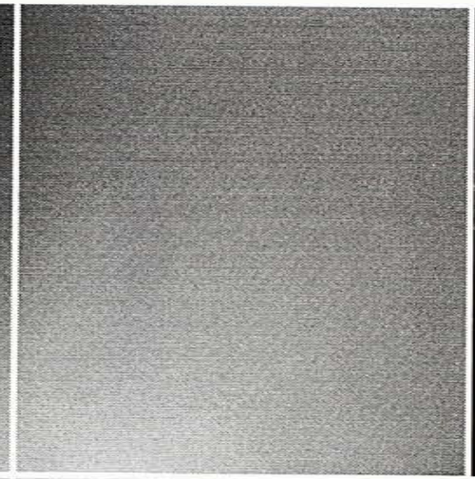
This series of lighting system is called the powerdisk S-AS. it is used to make upward lighting from ground level upwards.

In the structure the main mast is the most important structural member. Lighting of it can enhance the legibility of the design and provide ambient lighting for users.

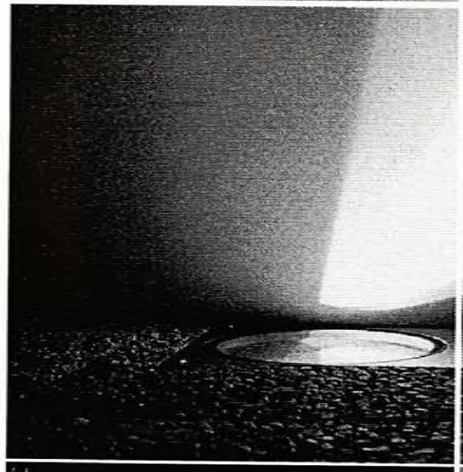
LIGHTING STUDIES

POWERDISK/S-AS

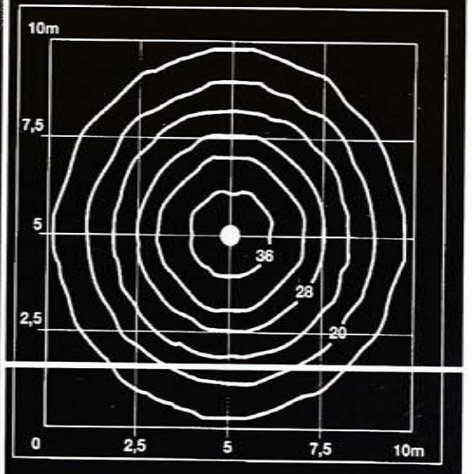




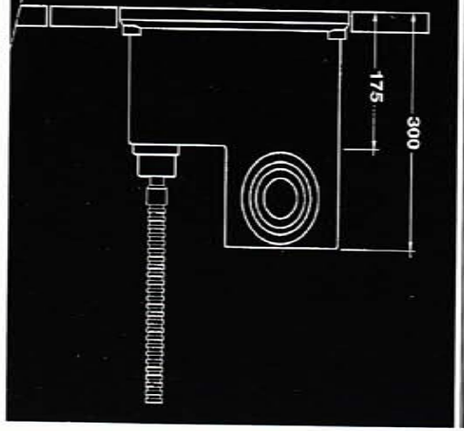
EFFECT

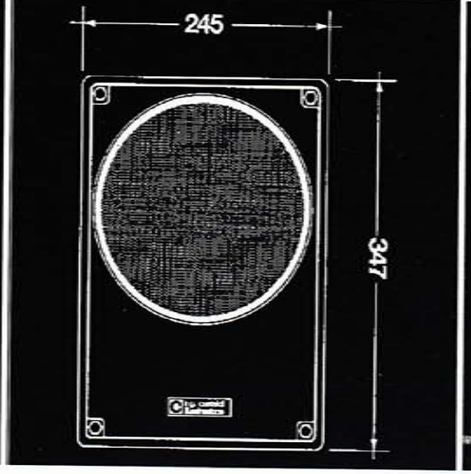


isolux distribution
horizontal plane height 8 m from ground level
powerdisk/S-MV125

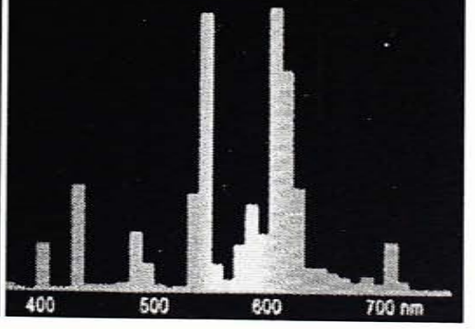


DIMENSION





COLOR SPECTRUM

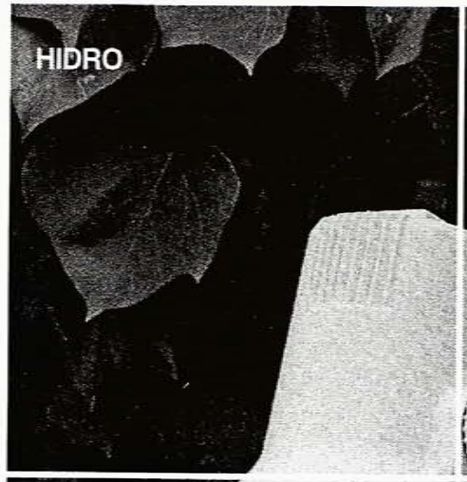


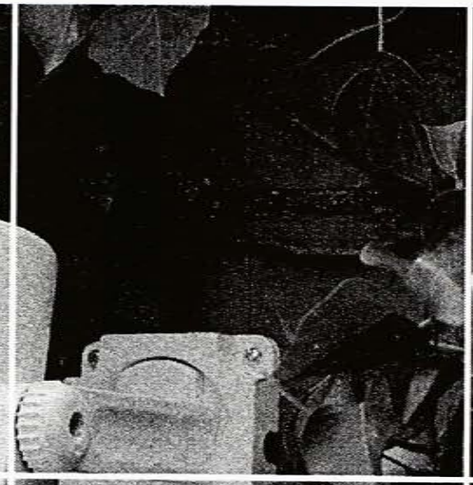
5.7 MODULAR LIGHTING SPECIFICATION

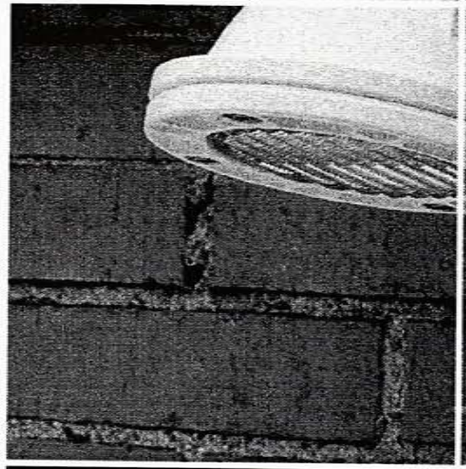
Hidro lighting is a small, compact, but powerful flooding designed for a host of indoor and outdoor applications. It can provide bright, soft and direct, indirect lighting.

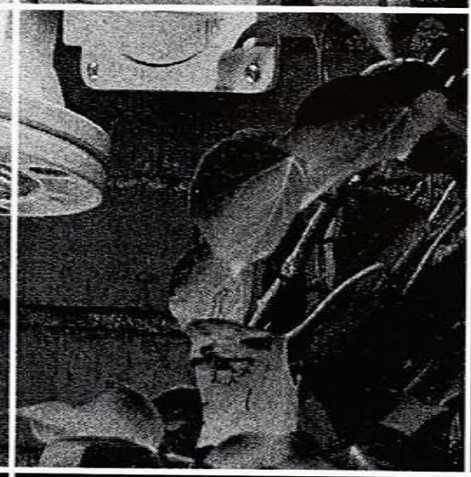
In the structure the main mast is the most important structural member. Lighting of it can enhance the legibility of the design and provide ambient lighting for users.

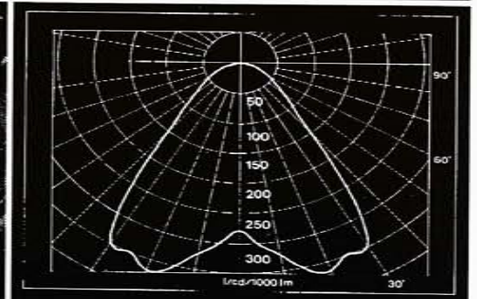
LIGHTING STUDIES



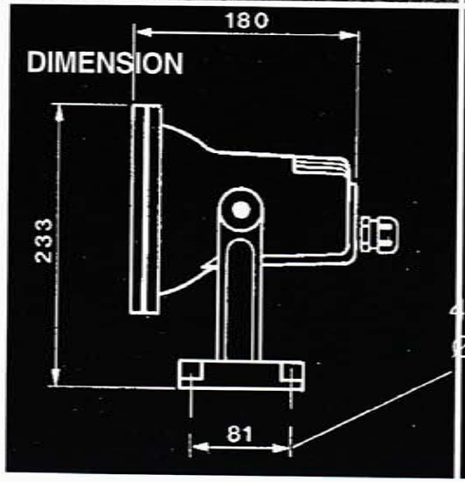


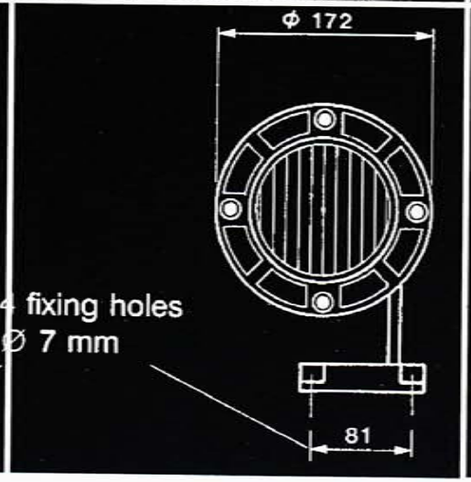


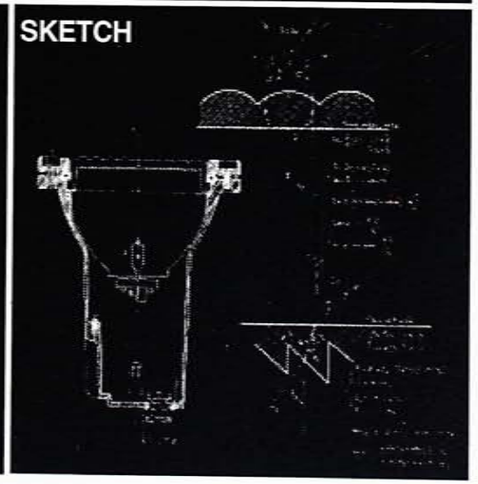




hidro/lens
diffused light - wide beam
polar distribution of luminous intensity
standard incandescent lamp
100W-E27-220V
lamp flux reduced to 1000 lumen

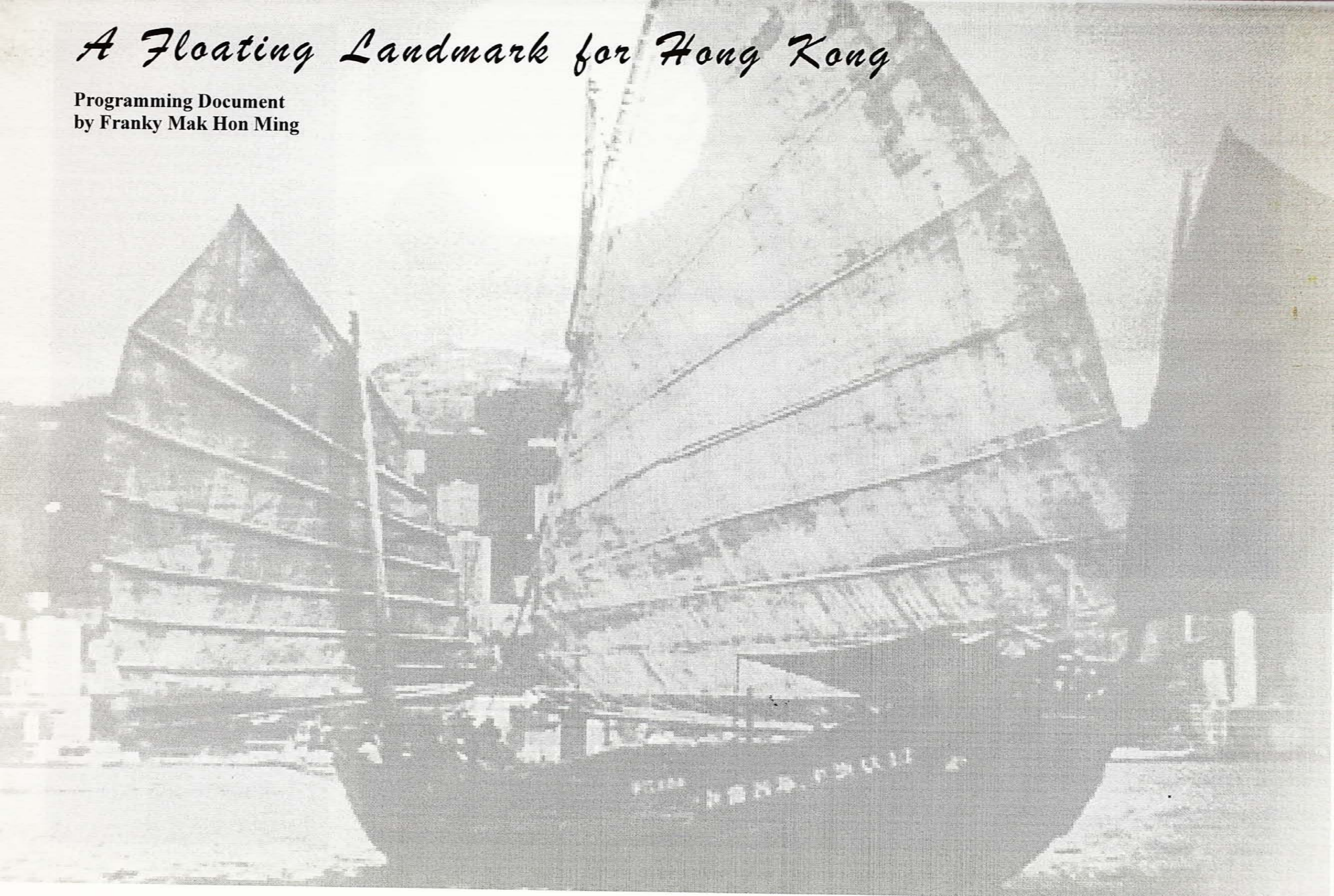




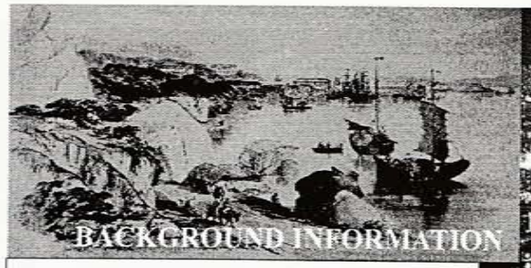


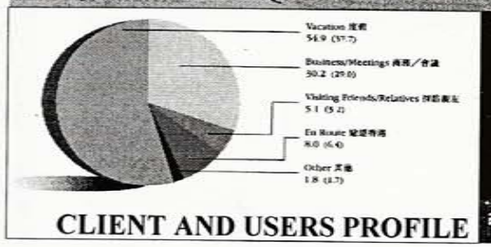
A Floating Landmark for Hong Kong

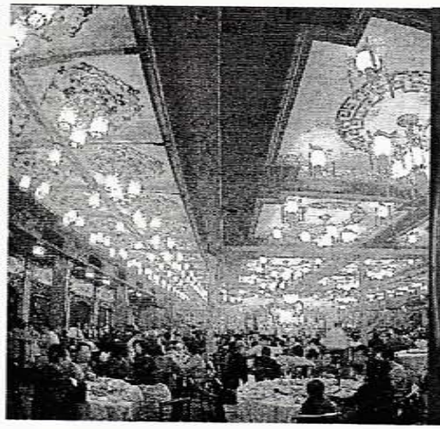
Programming Document
by Franky Mak Hon Ming

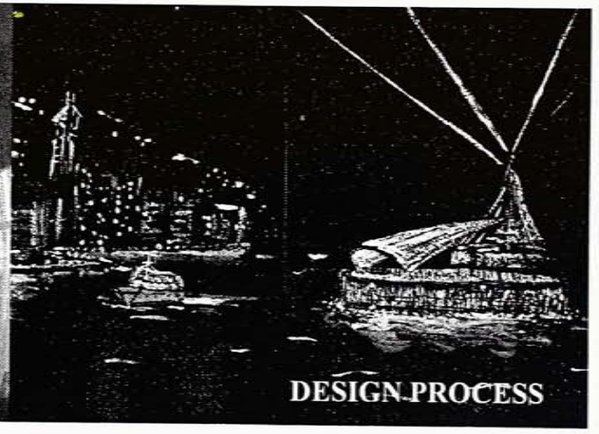


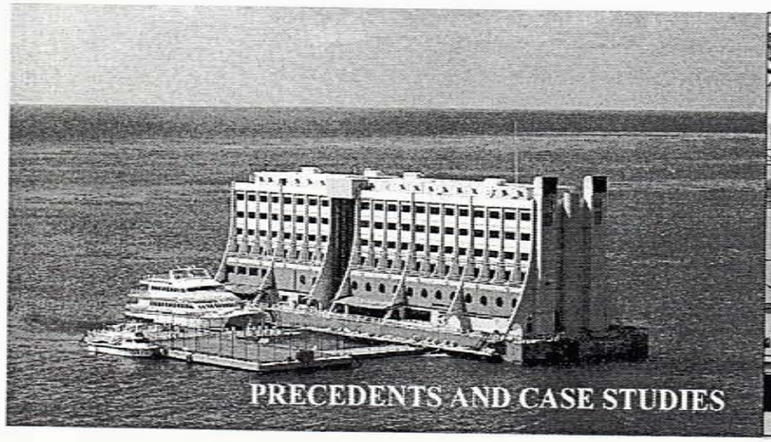
CONTENTS

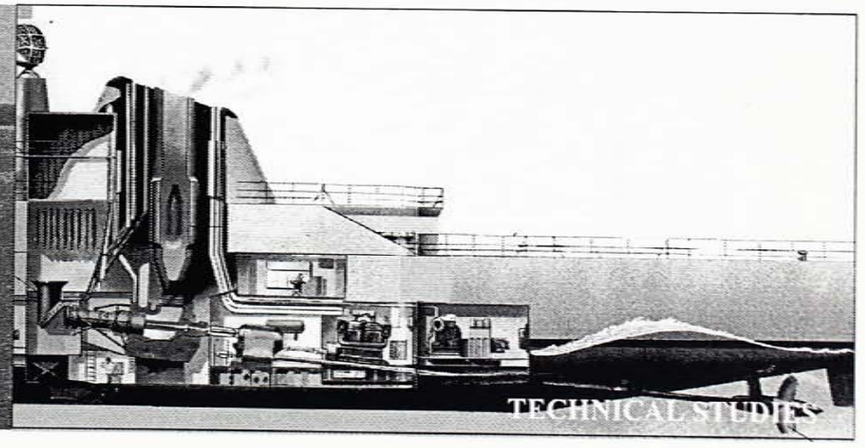






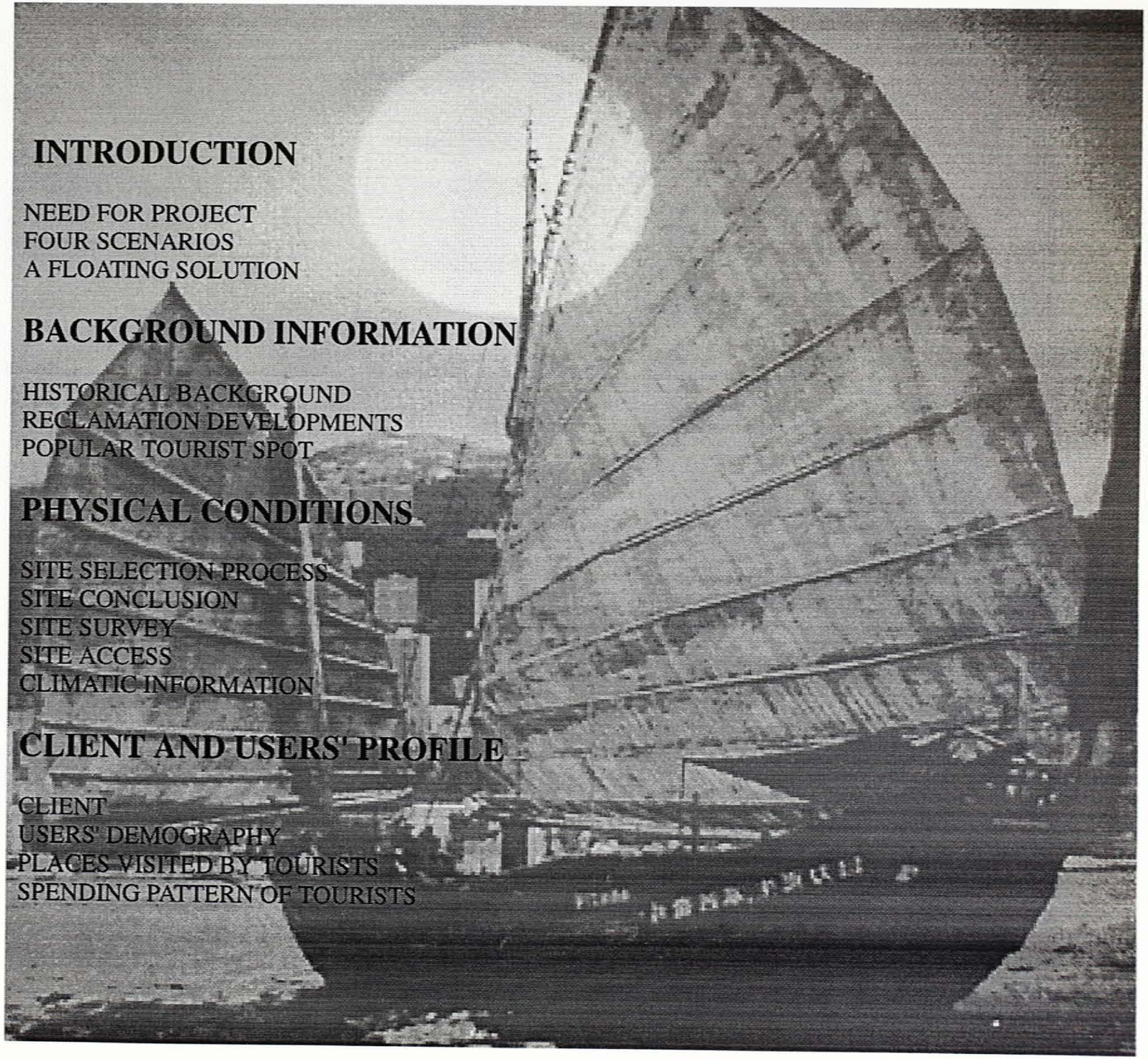






PART A

EXISTING STATE



1.1
NEED FOR PROJECT

PRIMARY NEED

On 1st July, 1997, Hong Kong is going to be back to China. This will probably be the most remarkable history of the world. The ceremony of the return of sovereignty will also be extremely important. From that reason, a place is necessary for the operation of commemoration of this historical event.

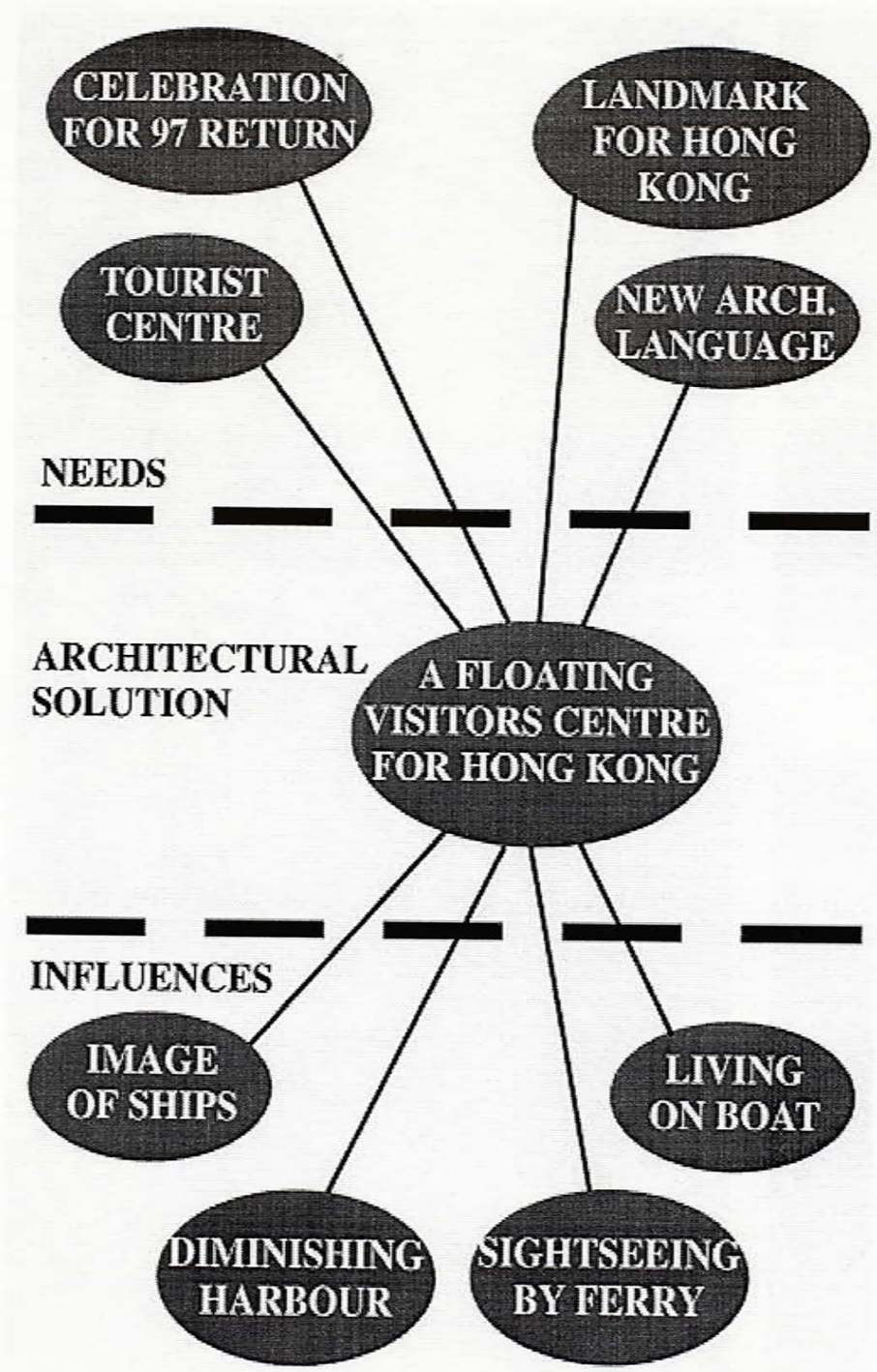
PSYCHOLOGICAL NEED

Besides for the commemoration purposes, this project should express the historical, social, and cultural conditions of Hong Kong at this era. This should also be built as a landmark for Hong Kong, introducing a new icon for Hong Kong since then.

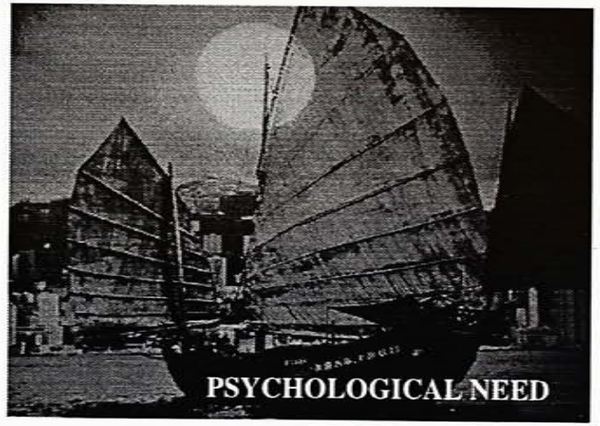
FUNCTIONAL NEED

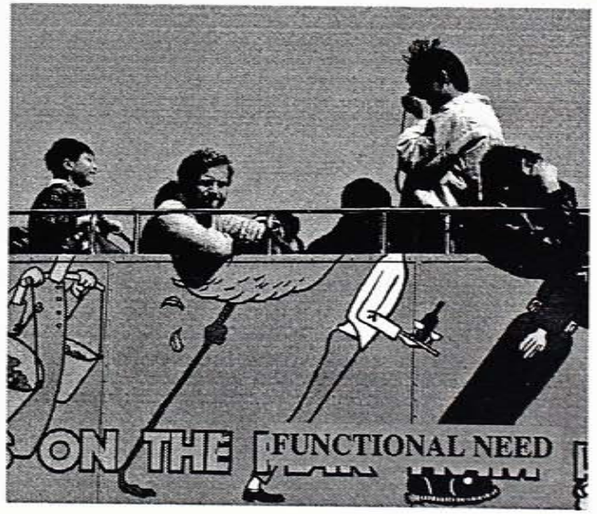
Hong Kong is a very popular tourist spot. However, there are no center to accomplish the need of that. Therefore, this project should be functioned as a tourist center which it helps the development of Hong Kong's tourist industry.

PHOTO CREDITS
Trea Wiltshire, Hong Kong - Last Prize of Empire, Formasia




PRIMARY NEED


PSYCHOLOGICAL NEED


FUNCTIONAL NEED

1.2
FOUR
SCENARIOS

IMAGE OF SHIP

The image of Hong Kong is come from the existence of ships and boats in the Victoria Harbour. Is the boat the icon of Hong Kong ?

DIMINISHING HARBOUR

The West Kowloon Reclamation is a solution for the lackage of land but it creates great environmental problem. Is it the only solution in creating land?

SIGHTSEEING BY FERRY

The itinerary of any tourists must include the sightseeing activities by ferry in the middle of the Harbour. But why can't I stand in the middle of the Harbour and view Hong Kong ?

LIVING ON THE BOAT

There are still some Hong Kong residence living on the boat succeeding the traditional fishing village life. Can I say a boat is a form of architecture?

PHOTO CREDITS
Saul Lorkhart, Insight Guides
- Hong Kong, APA Productions

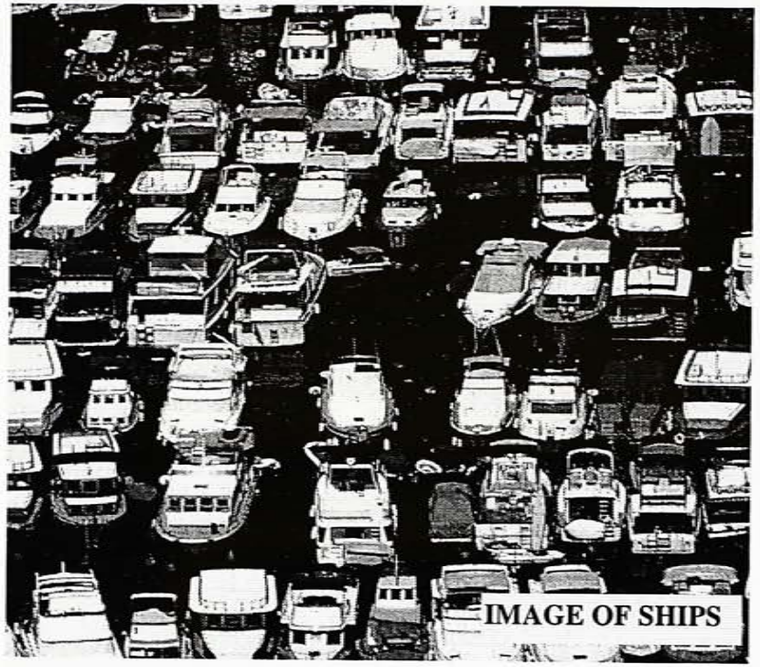
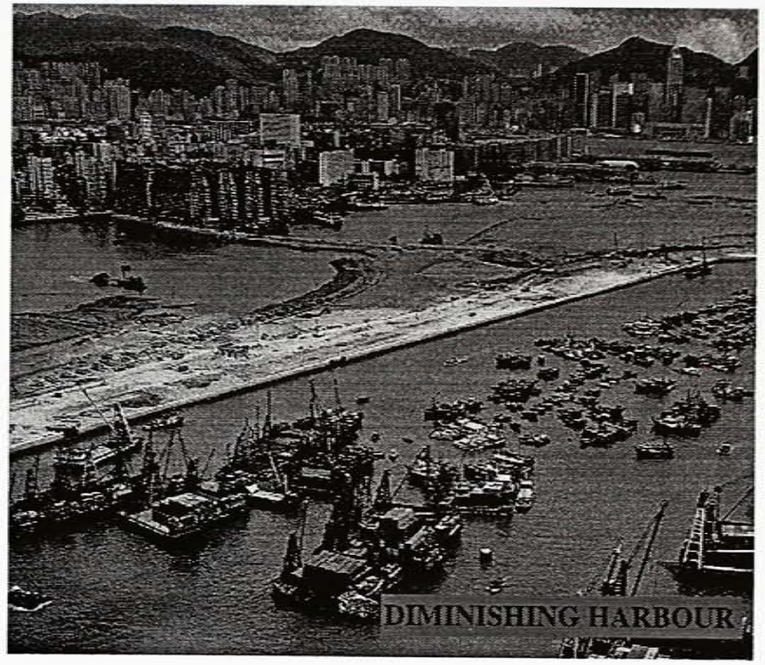
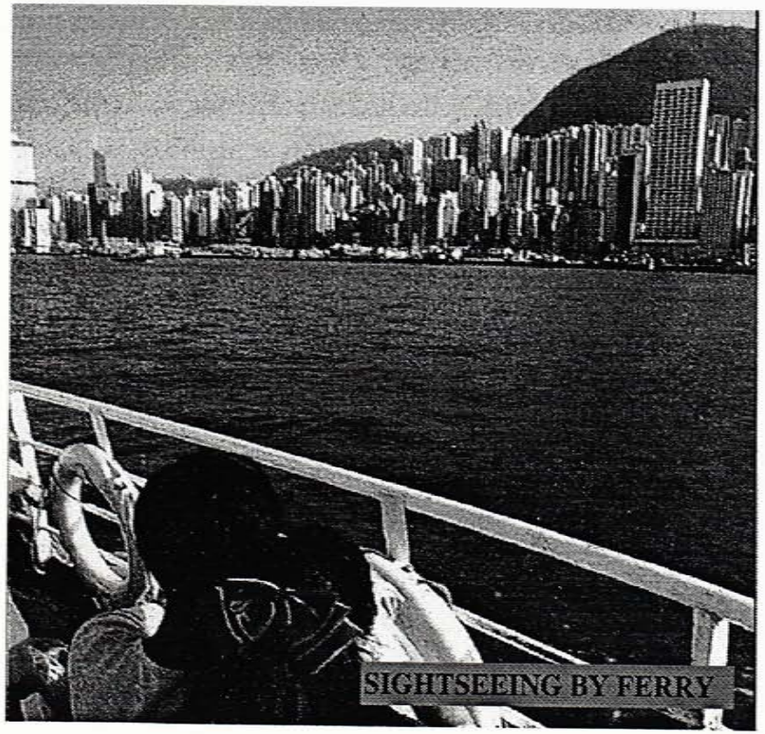
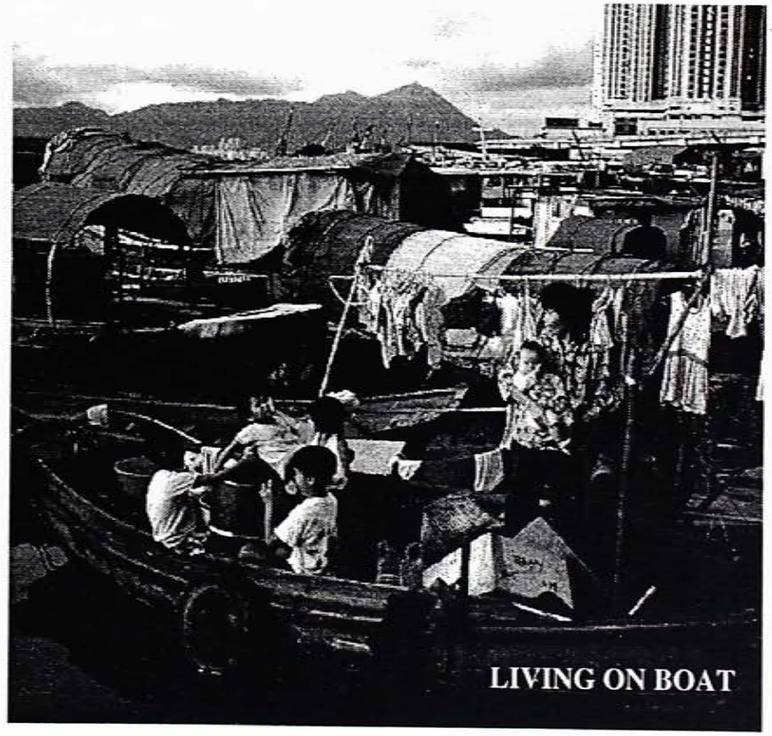


IMAGE OF SHIPS


DIMINISHING HARBOUR


SIGHTSEEING BY FERRY


LIVING ON BOAT

1.3
A FLOATING SOLUTION

These scenarios and questions make me have a revolutionary design approach to this project. Is it feasible to design a project that is floating architecture in the middle of the Harbour, that can let people experience of standing on a boat.

The methodology of design is similar to design a ship. Therefore, in this thesis, I would like to attempt to investigate the concept of a floating landmark as a monument for Hong Kong 97. This landmark is floating that it creates ground spaces on the water without landfilling it; it creates buildings without hitting piles into the ground; it builds without actually building it on site. These, in turn, tremendously reduces the environmental impact in the construction process to the congested context of Hong Kong.

PHOTO CREDITS
Yoshio Yoshida, The Japan Architect,1995-4, Shinkenchiku

AFLOAT ON THE SEA

A FLOATING ARCHITECTURAL ARTIFACT, BY ITS VERY NATURE, MAINTAINS ORDER AGAINST THE FLAT SURROUNDING SEA.

2.1 HISTORICAL BACKGROUND

HONG KONG'S SUCCESS

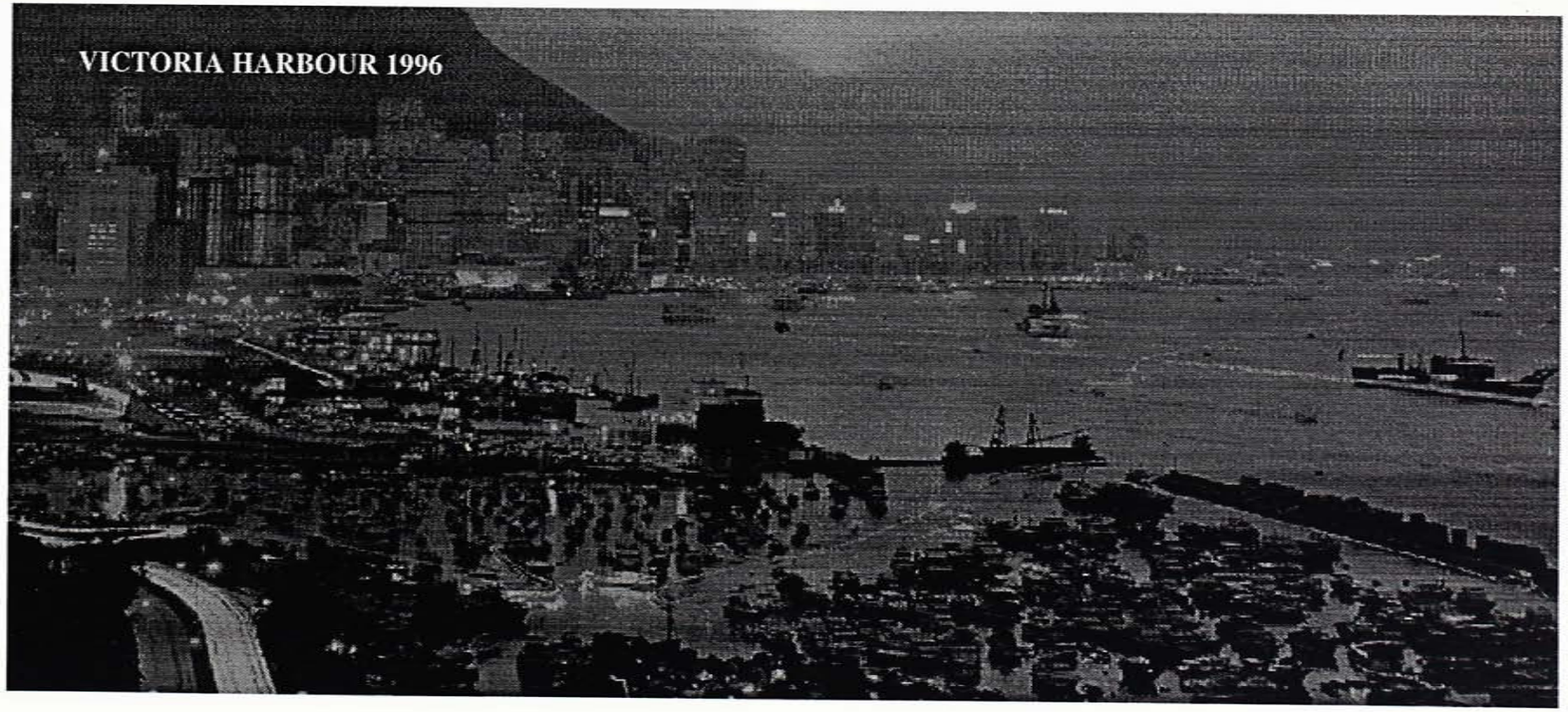
Hong Kong has a very good geographic location as well as a good Harbour. In the past, ship is the most important trading means. As Hong Kong is located in the Tip of the South China Sea and has a deep water Victoria Harbour, it is the best location for ships to port and it makes the Harbour famous.

FROM BARREN ROCK TO ECONOMIC DRAGON

Prior to the arrival of the British, Hong Kong a place without any natural resources. Fisherfolk who chased shoals in a protected swath of water Later on, as China was defeated in the opium war, Hong Kong Island was ceded by China to Britain in 1842. With the arrival of the British, Hong Kong became one of the galaxy of far-flung imperial islands and the Harbour become the financial and corporate centre. In less than 150 years, Hong Kong is transformed into one of the great cities of the world.

PHOTO CREDITS
Saul Lorkhart, Insight Guides - Hong Kong, APA Productions

VICTORIA HARBOUR 1846



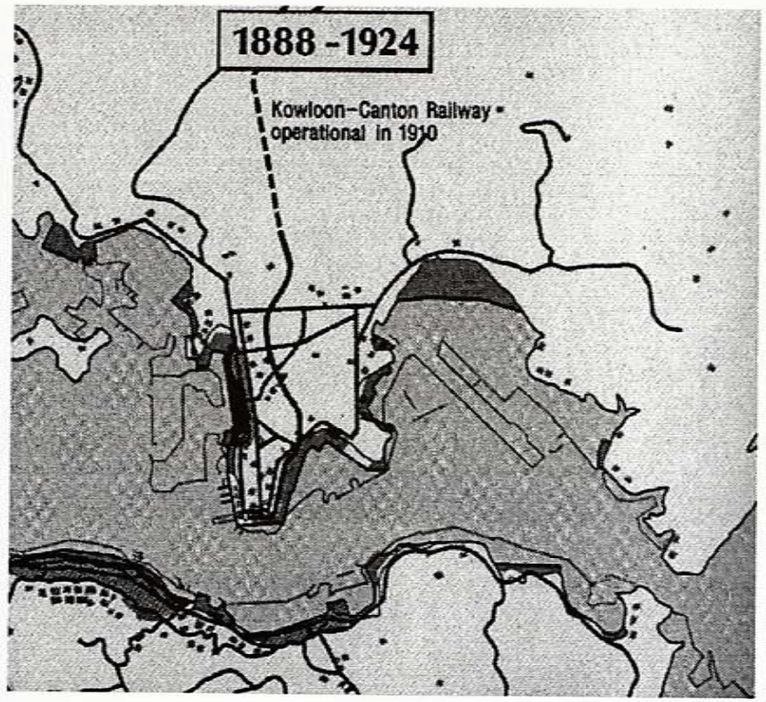
VICTORIA HARBOUR 1996

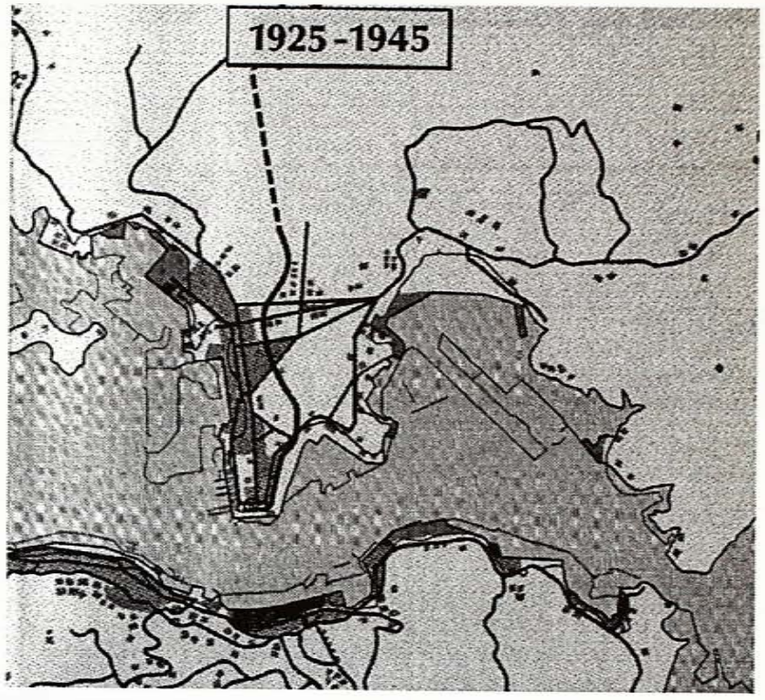
2.2
RECLAMATION DEVELOPMENTS

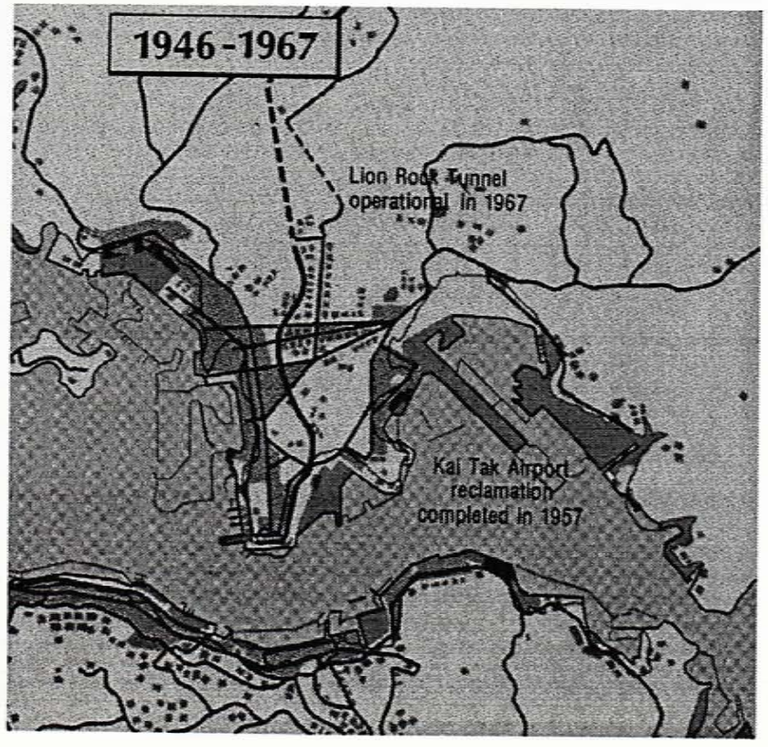
Harbour reclamation is started in a century ago. The rationale behind is the lackage of land. From the diagrams on the right, we can see the reclamation process happens along the both sides of the harbour, diminishing the width of it and increasing the amount of land. This can temporarily solve the demand of land. However, what we should think about is the development of the city is unlimited and the amount of land yielded on reclaiming the Harbour is quite limited. Therefore, we should really think of other ways of solving this problem.

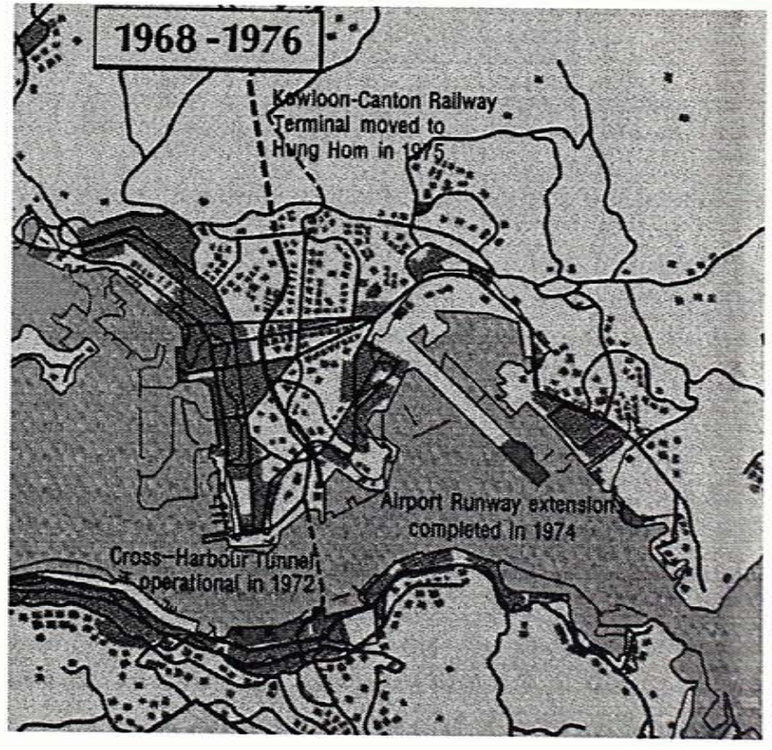
In fact, utilize the water surface is a future trend of the city development and so it is not irrational to predict the future development is basically on the water surface without reclaiming the harbour. This can lessen he environmental impact of the reclamation. Also, the development is even mobile so that it can be flexible to move to anywhere.

PHOTO CREDITS
Government information Services, Hong Kong 1995, Government Printing Department









2.3
POPULAR TOURIST SPOT

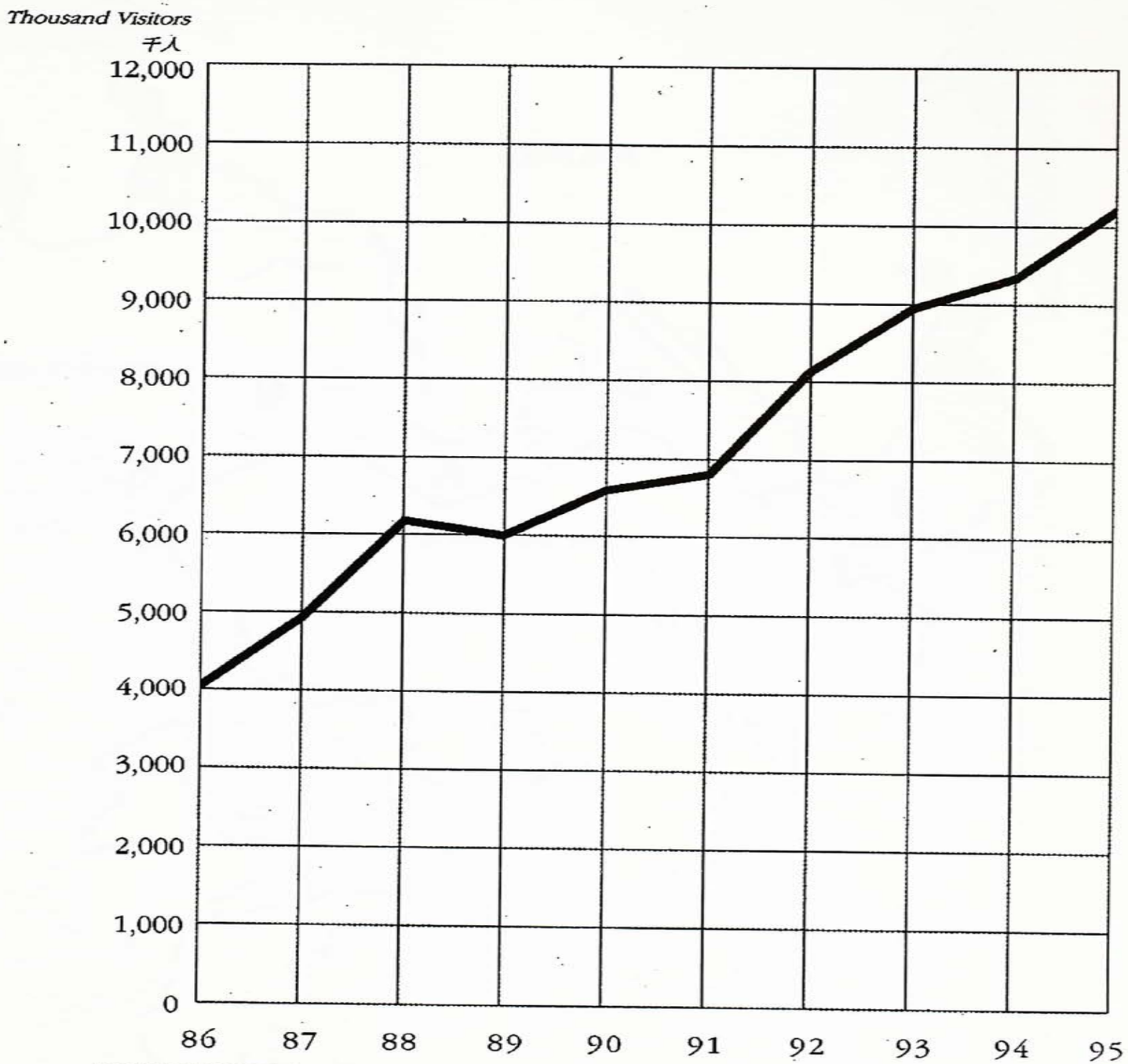
From the fact that Hong Kong is an international port with relatively cheap foreign currency value, it's been the Asia's most popular travel destination for years. In this project, one of the most frequent user group

From the Hong Kong Tourism report 1996, there are 10.2 million international visitors in 95, with 9.7% increment. These volume creates 72 billion earning in 1995, being the second earner of foreign exchange. With the return of sovereignty in 1997, it is no doubt that the coming years' number of visitors will even rise significantly and it was estimated that the figure would be more than 12 million, average 30,000 visitors per day.

The more detail analysis of the tourists is shown in the user group analysis.

PHOTO CREDITS
A Statistical Review of Tourism 1995, Hong Kong Tourist Association

STATISTICS:
Government information Services, Hong Kong 1995; Government Printing Department



TOTAL NUMBER OF VISITORS TO HONG KONG FROM 1986 TO 1995

3.1
SITE SELECTION PROCESS

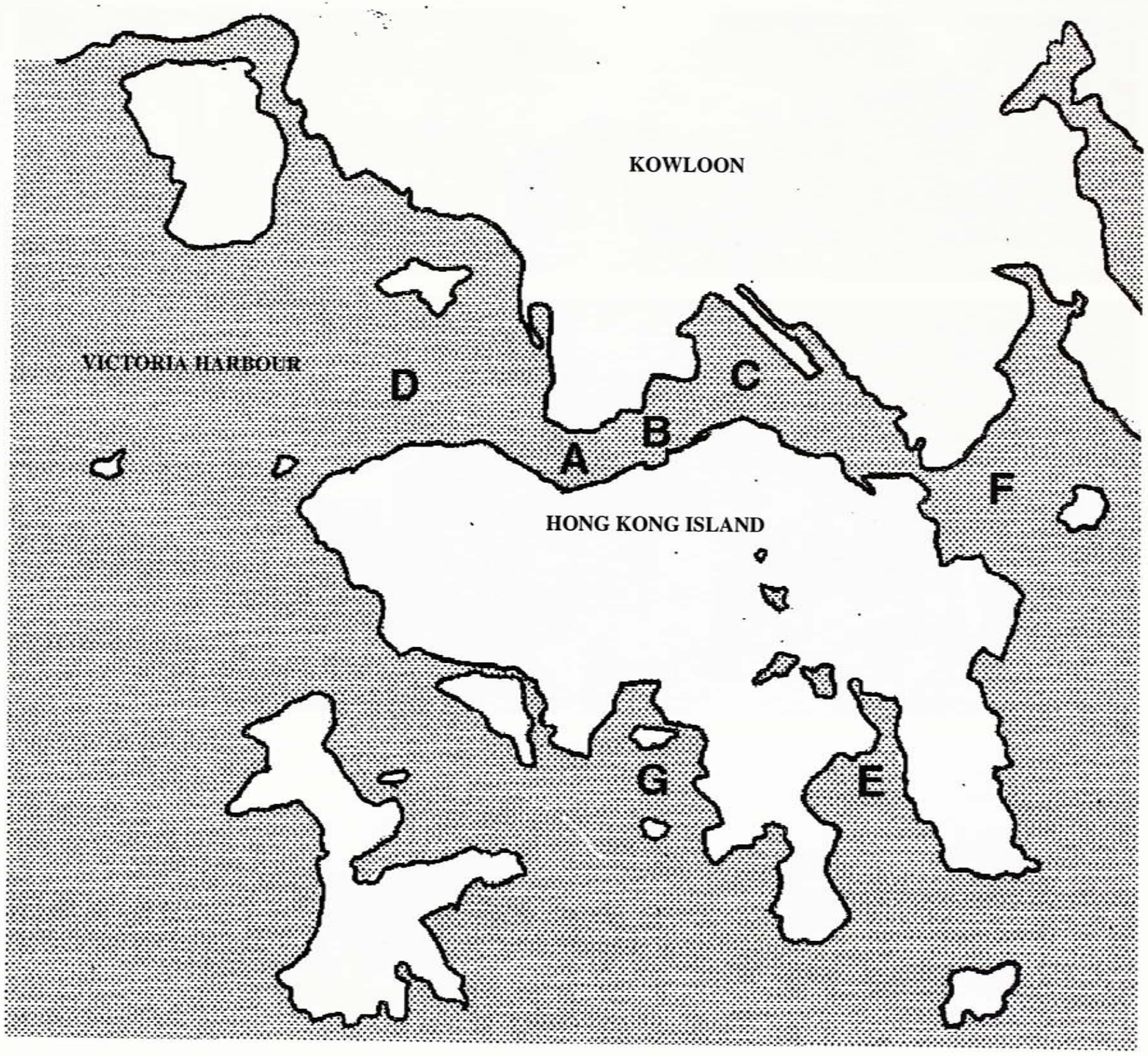
Seven site options are selected in different part of Hong Kong. They are:

A. between Tsimshatsui and Wanchai
B. between Tsimshatsui East and Causeway Bay
C. between Kowloon Bay and North Point
D. West Kowloon reclamation
E. Stanley
F. Junk Bay
G. Repulse Bay

Evaluation is based on six issues. They are:

1. Easy access for users
2. Good view to the surrounding
3. High visibility from nearby
4. Good zone for public uses
5. Minimum environmental impact
6. Prominent spatial location

	A	B	C	D	E	F	G
1	**	*	*	*			
2	**	*	*		**	*	
3	**	**	*	**	*		
4	**	**	*	**	*		
5			*	*		**	**
6	**	*	*	*			



3.2
SITE CONCLUSION

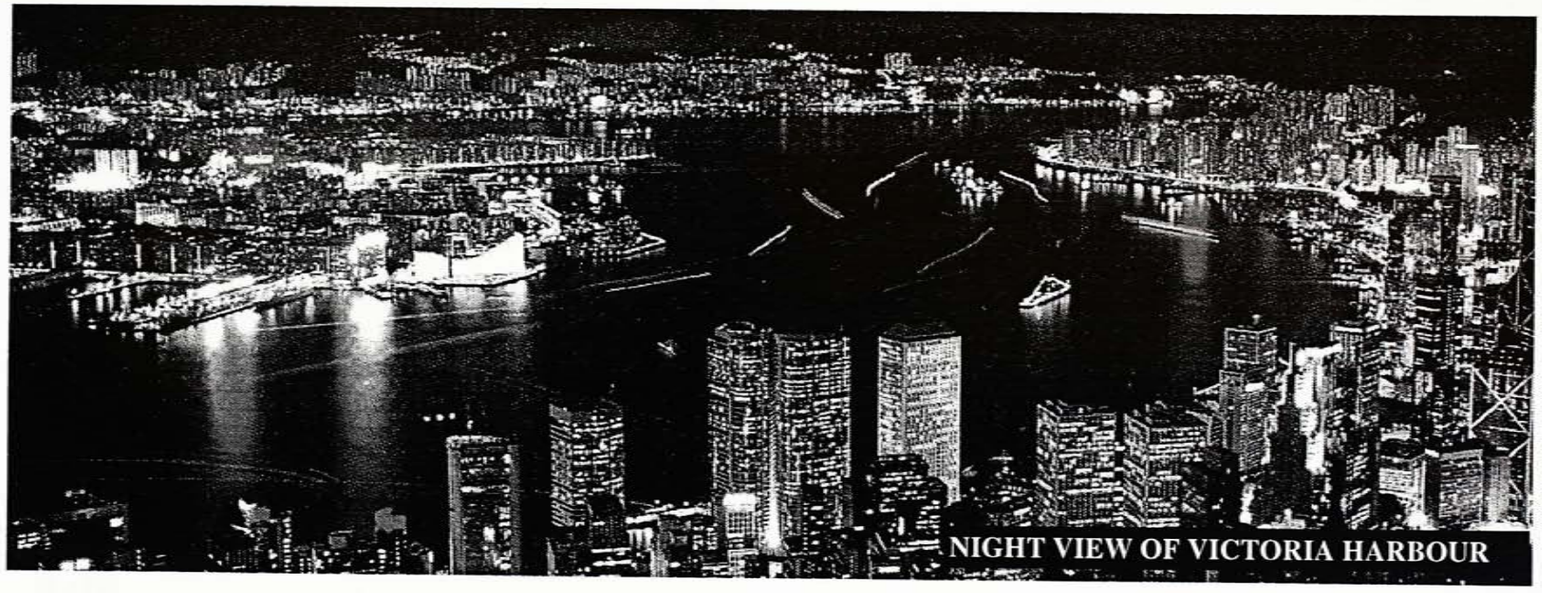
According to the results, it shows the site option 1 (BETWEEN TSIMSHATSUI AND WAN CHAI) is the best location for the project. However, it has a maximum environmental impact. For this conflict, it is proposed that the park is floating like a ship that it can move, that means --

IT DOES NOT REQUIRE A FIXED SITE!

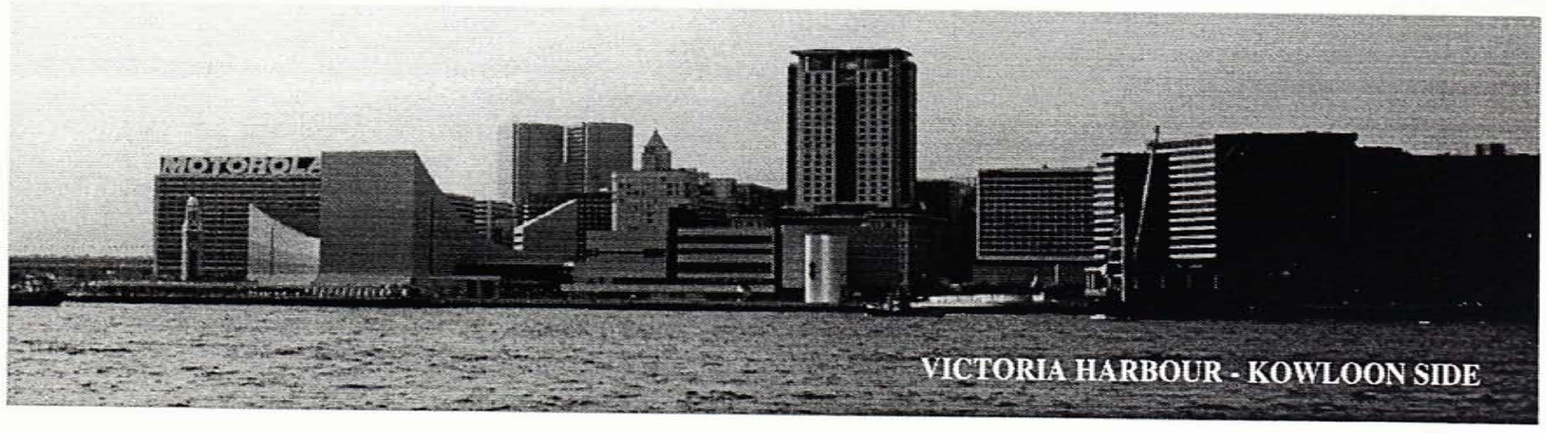
But for the sake of the project, the site option 1 is chosen for study. and the right side are the elevations of the two sides of the Victoria harbour

PHOTO CREDITS
Magnus Barlett, Over Hong Kong , Commercial Press Ltd.

VICTORIA HARBOUR - HONG KONG SIDE



NIGHT VIEW OF VICTORIA HARBOUR



VICTORIA HARBOUR - KOWLOON SIDE

3.3
SITE SURVEY

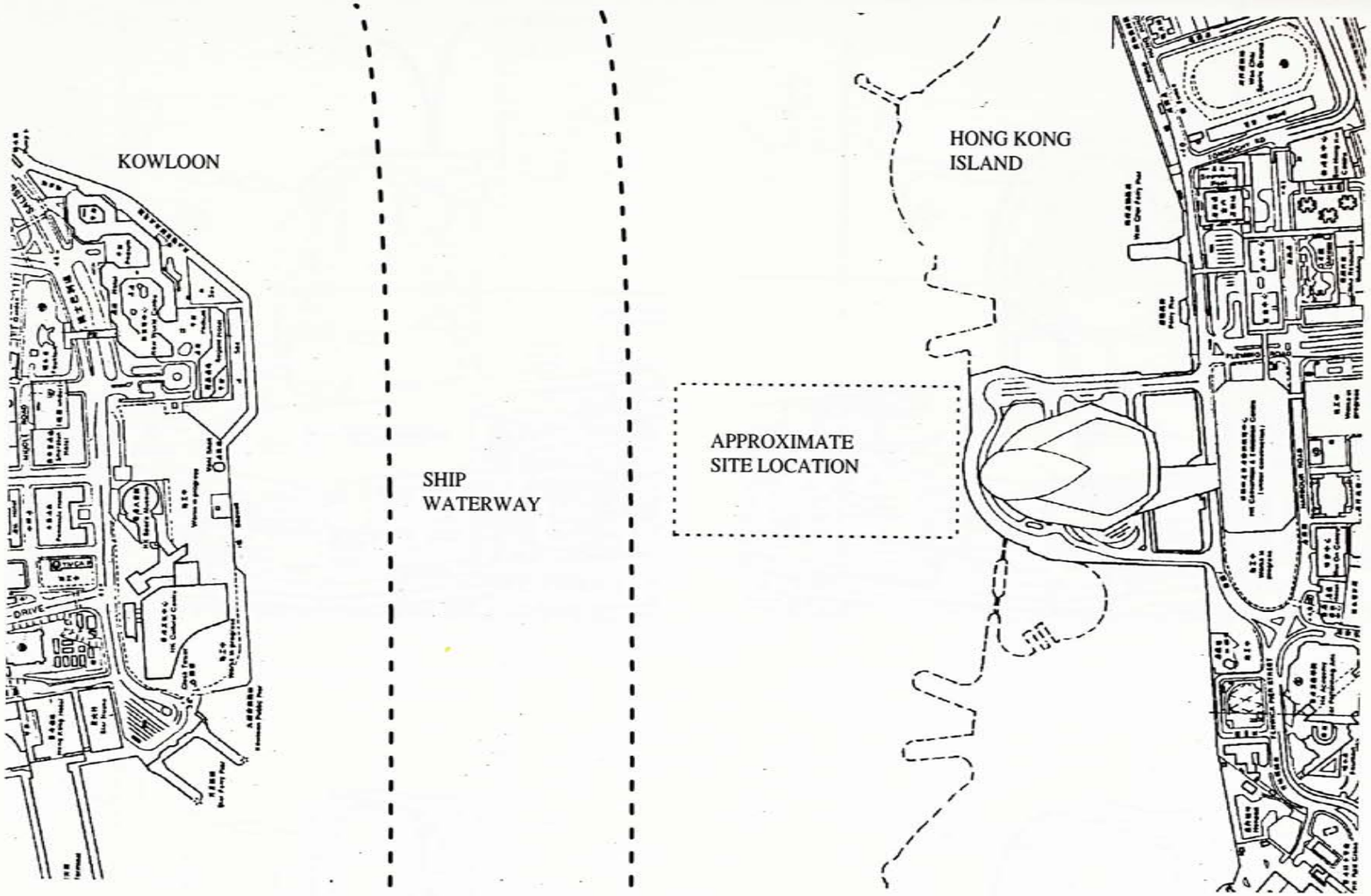
GENERAL

The site is in the most obvious point of the Harbour and can be said to be the most aggressive location -- in the middle of the Harbour. There are basically no site boundary, no need to calculate site coverage and plot ratio, as the building object can be moved to other places as well. However, the most critical issue to investigate is the existing congesting water traffic that cause a lot of constraints to the future solution.

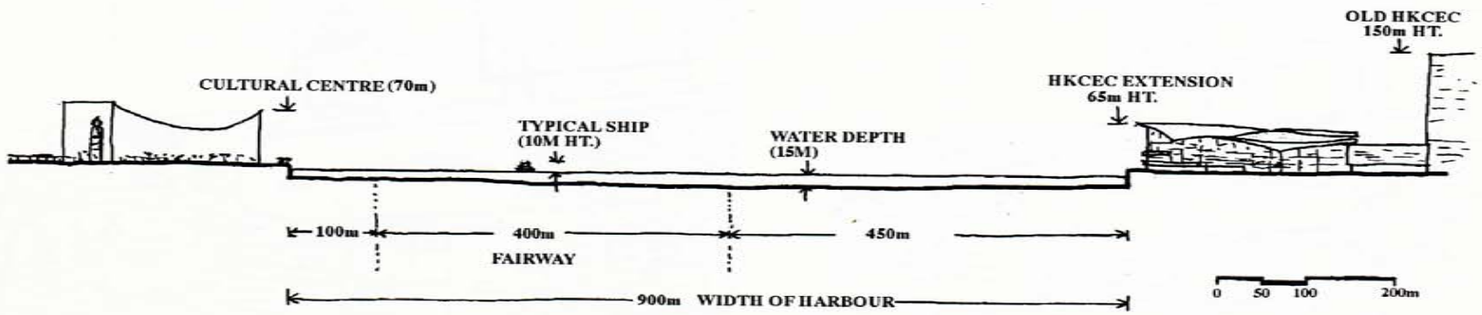
TIDE

The tide effect is very important to the design of the floating object. Investigation shows the tide in water level is only 1.4m from the shore and the tide out water level is around 2.8m.

PHOTO CREDITS
Government Information Service,
Survey plan, the government



SITE PLAN



SITE SECTION

3.4
SITE ACCESS

Basically, there are four main access routes to the site. They are by ferry, by MTR, by bus or cars and on foot.

FERRY

The shore of the HKCEC is located beside the Star ferry pier. That pier has ferry connected to Tsimshatsui and Hung Hom.

MTR

Most of the public use MTR as a means of transportation. People can walk along the shore pedestrian circulation to the site.

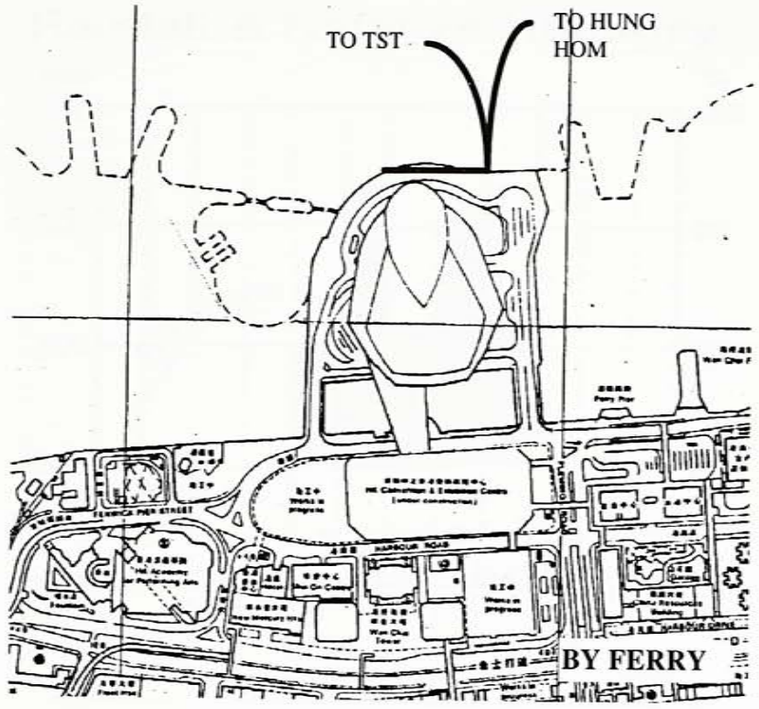
CARS AND BUSES

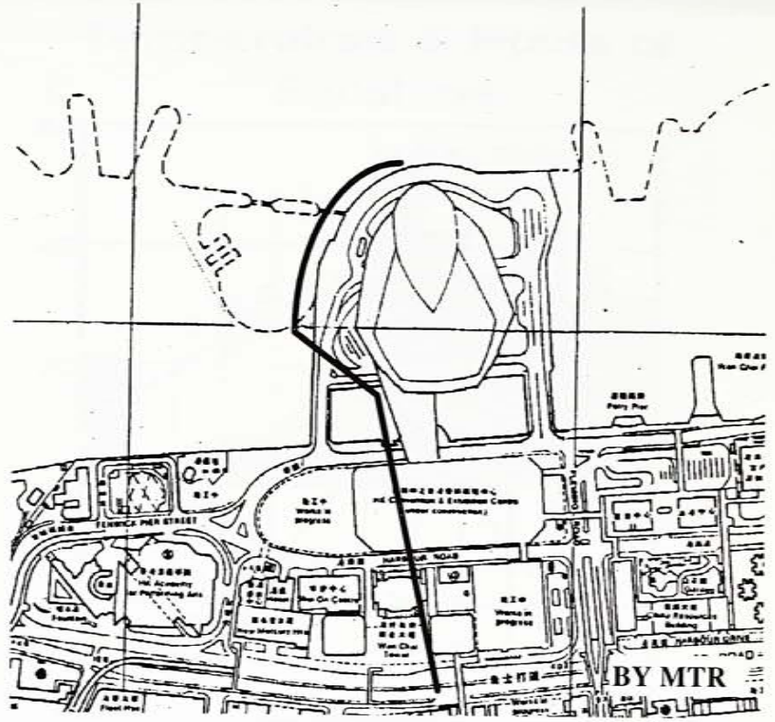
There are carparks and public bus terminals at the HKCEC extension. Visitors can alight there and walk to the site.

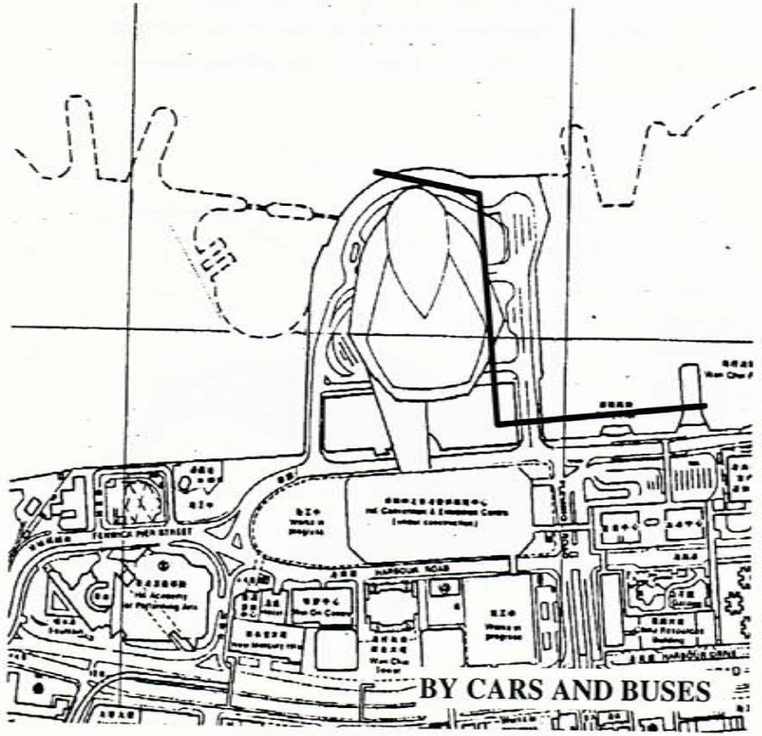
ON FOOT

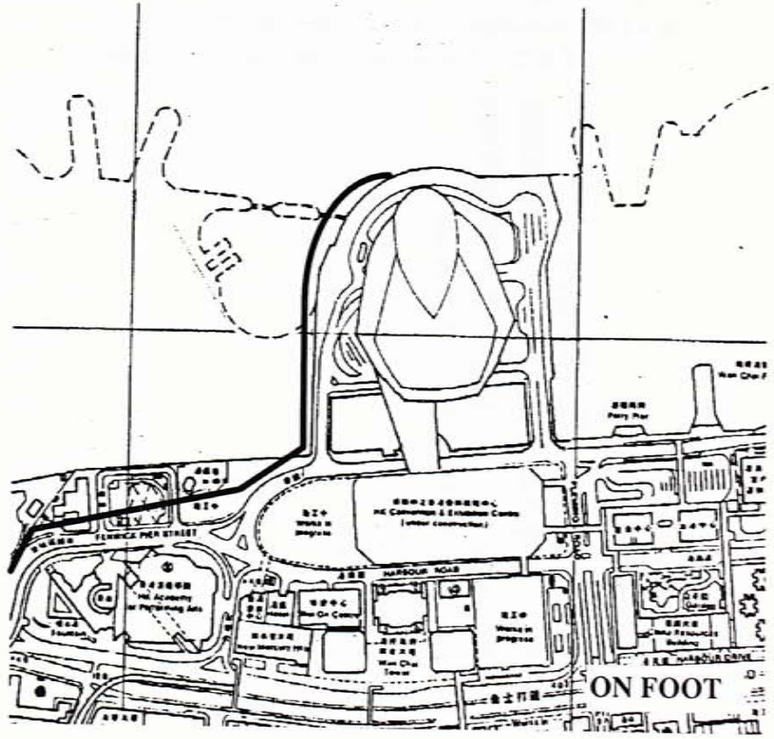
There are a loop circulation outside the HKCEC extension building so that people from both sides can access to the building.

PHOTO CREDITS
Government Information Service,
Survey plan, the government









3.5
CLIMATIC INFORMATION

PRECIPITATION

The mean annual rainfall is 2224.7mm and the rain season is around June and August which makes up 3/4 of the total rainfall.

HUMIDITY

The Relative humidity is high and the annual mean is around 78%. The humidity is higher than 80% in summer and relatively lower in winter.

TEMPERATURE

The annual average temperature is 22.8C. In summer, average temperature exceed 28C and in winter, average temperature is about 13C.

SUNLIGHT

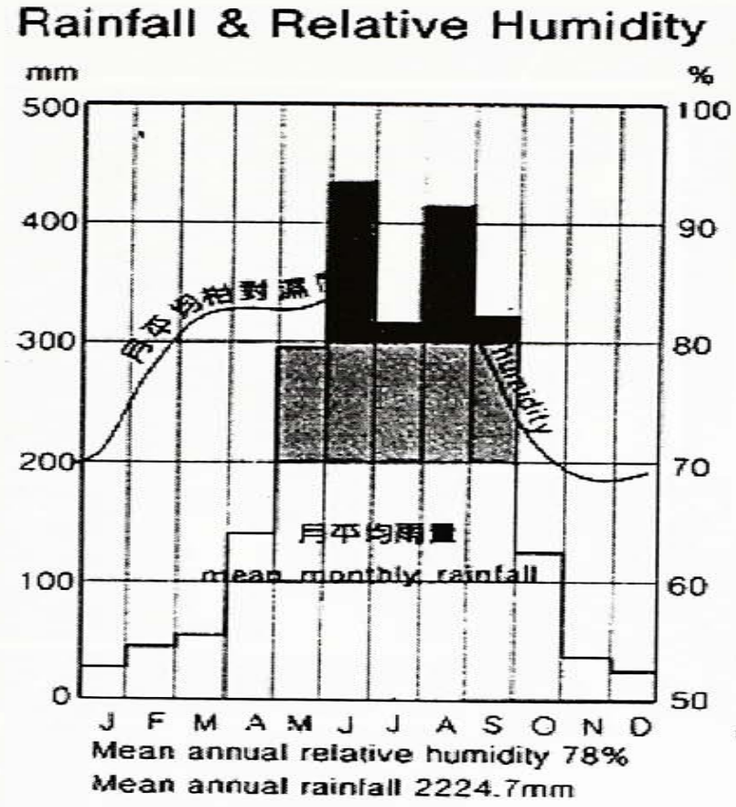
The mean annual hours of sunshine is 2011.6 hours and the number of hours of sunshine is higher in summer than in winter.

WIND AND TYPHOON

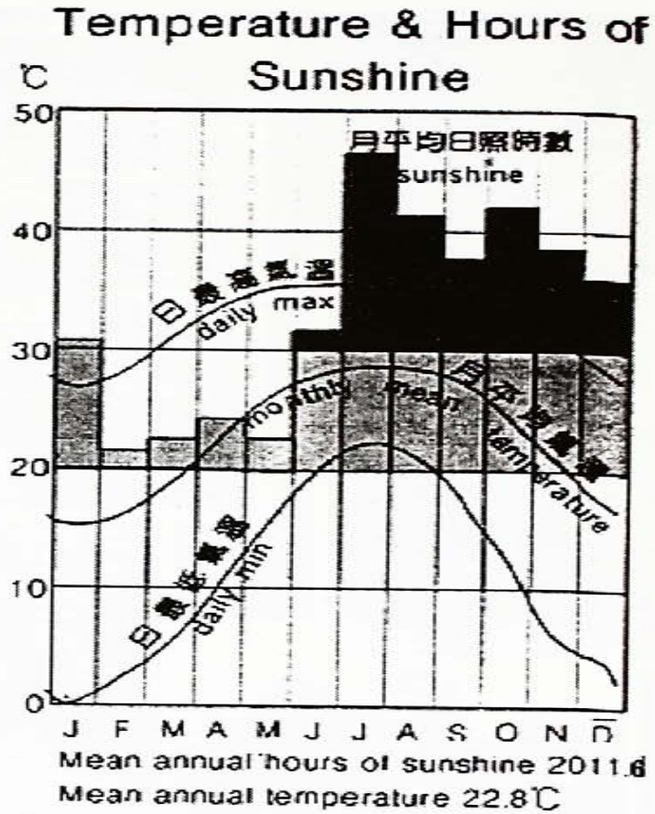
The prevailing wind is southwesterly or southerly in summer. In winter, Hong Kong is affected by northerly, easterly and northerly wind. In summertime, typhoon may occur and the wind speed when can up to more than 100km/h.

PHOTO CREDITS

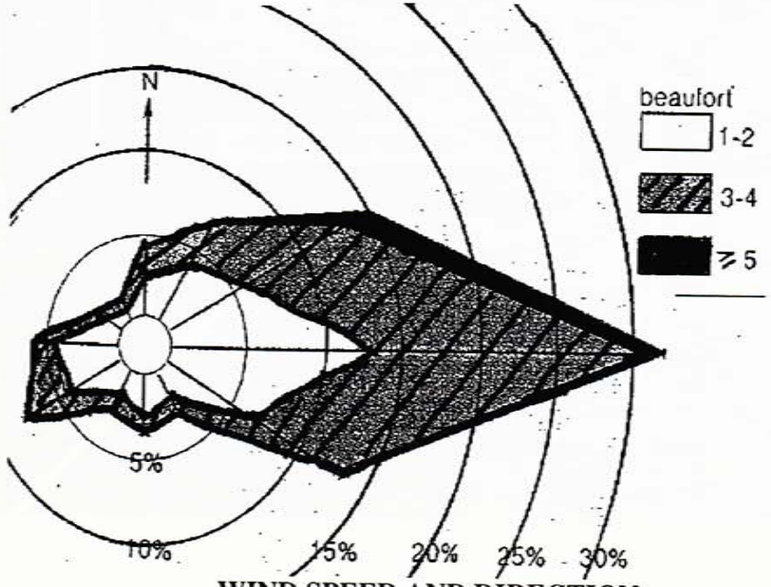
Government Information Service,
Hong Kong Geography, Government



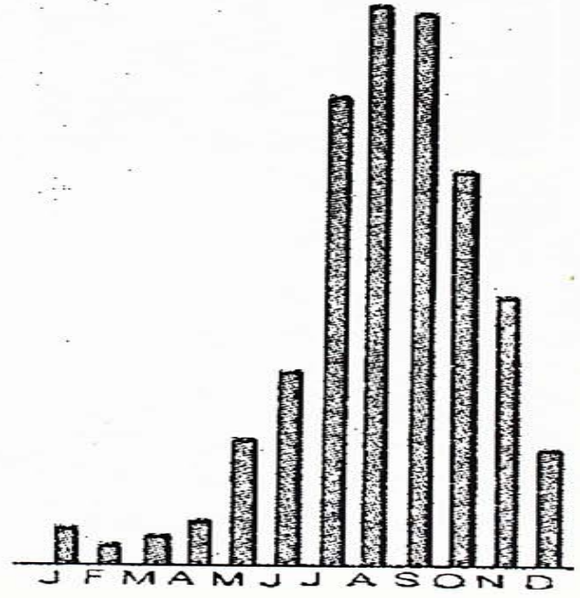
Mean annual relative humidity 78%
Mean annual rainfall 2224.7mm



Mean annual hours of sunshine 2011.6
Mean annual temperature 22.8℃



WIND SPEED AND DIRECTION



FREQUENCY OF TYPHOON OCCASION

4.1
CLIENT

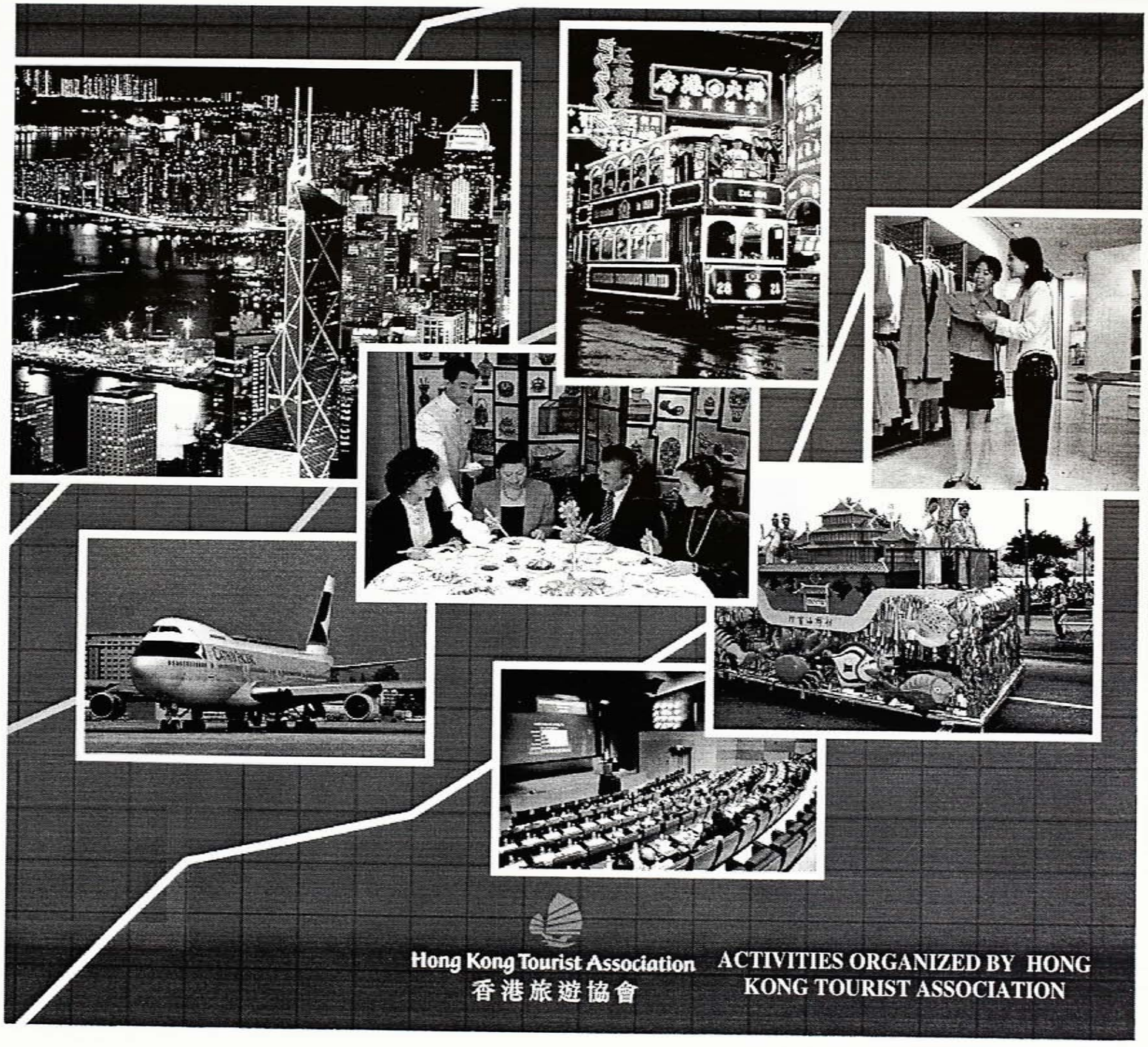
HONG KONG TOURIST ASSOCIATION

The client of this floating is the Hong Kong Tourist Association, which is established in 1957 by the Hong Kong government to develop tourism industry in Hong Kong. The objectives of increasing the number of visitors is achieved by the following activities:

1. Improve the visitors' facilities
2. Secure publicity of Hong Kong
3. Coordinate activities of tourism industry
4. Advice government on industry-related matters

In conclusion, it maximizes the tourism industry's contribution to social-economic prosperity of Hong Kong.

PHOTO CREDITS
A Statistical Review of Tourism 1995, Hong Kong Tourist Association



Hong Kong Tourist Association
香港旅遊協會

ACTIVITIES ORGANIZED BY HONG KONG TOURIST ASSOCIATION

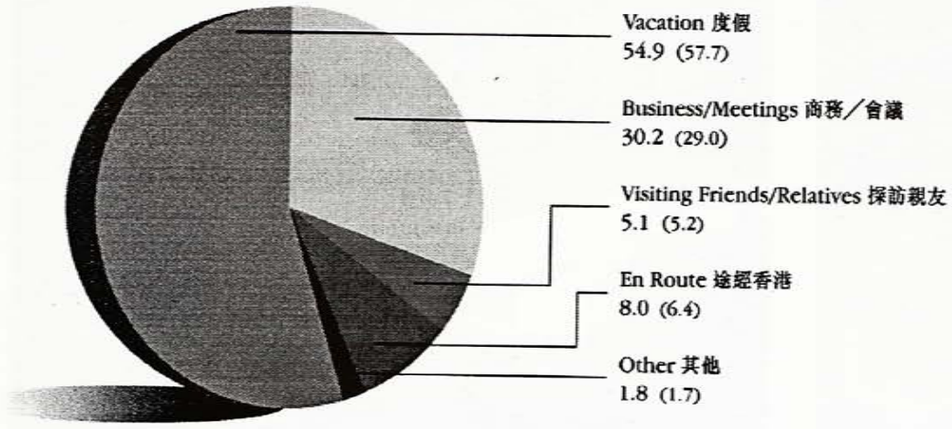
4.2
USERS' DEMOGRAPHY

TOURISTS

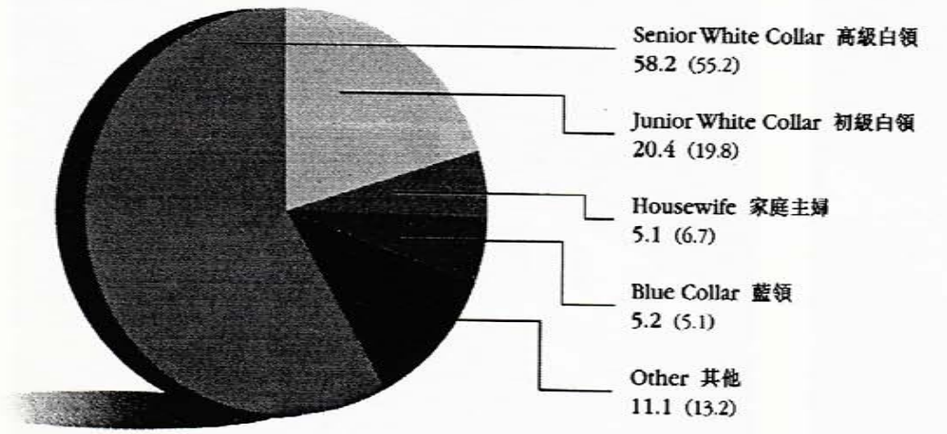
This is the most important category as this landmark of Hong Kong should be as a visitors' center and every tourist will visit it. There will be visitors' facilities such as gift shops, food stalls, restaurants, exhibition areas and viewing tower so that the object has its commercial value to generate revenue.

Though there are over 10 millions visitors a year visiting Hong Kong. Not all are for sightseeing purposes. From the chart, it shows only 54.9% of the tourists are for vacation. However, there are already over 6 millions of visitors for sightseeing purposes and will be using the visitors' facilities in Hong Kong. The chart in the right shows the demographics of the tourists visiting Hong Kong.

PHOTO CREDITS
A Statistical Review of Tourism 1995,
Hong Kong Tourist Association



BY PURPOSE - IT SHOWS 54% OF VISITORS ARE FOR SIGHTSEEING PURPOSES



BY OCCUPATION - IT SHOWS MORE THAN HALF OF THEM ARE SENIOR WHITE COLLARS

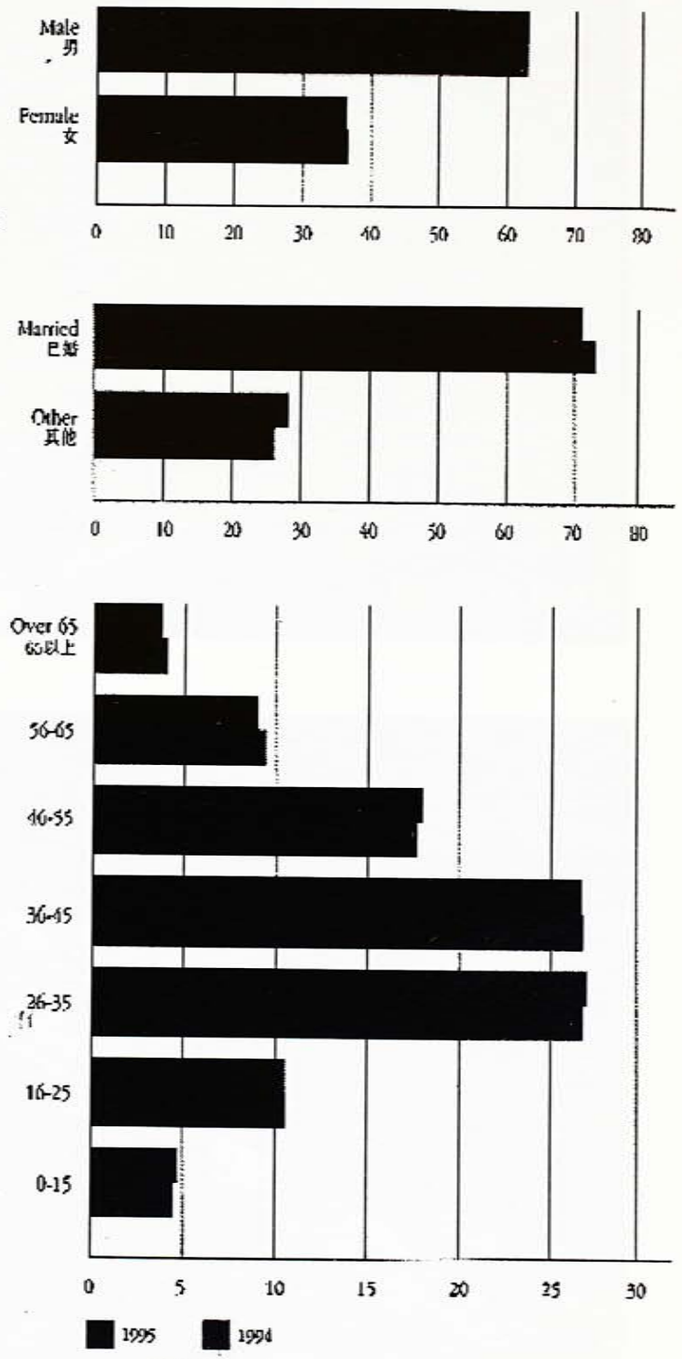


CHART SHOWING DEMOGRAPHY

4.3
PLACES VISITED BY TOURISTS

VICTORIA PEAK (4.5 MILLION)

It is the most famous place for the visitors. There are 4.6 million visitors visited in 1995 and on average, there are 45% of yearly visitors having been to there.

REPULSE BAY (2.7 MILLION)

It is the second most popular place visitors visited in 1995 having 2.5 million visitors. A few years before, there are not so much percentage visiting there but as the visitors' facilities being built there, it have a sharp rose on popularity.

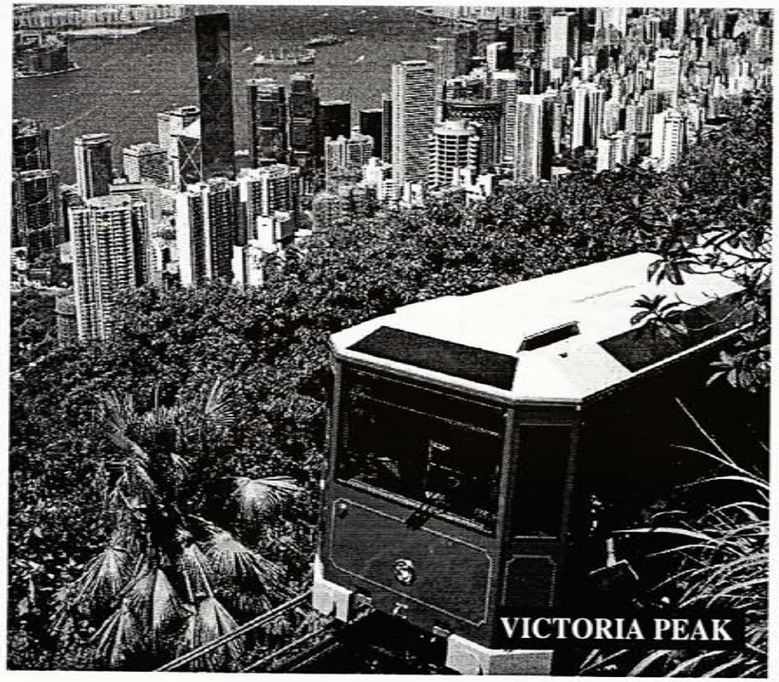
OCEAN PARK (2.6 MILLION)

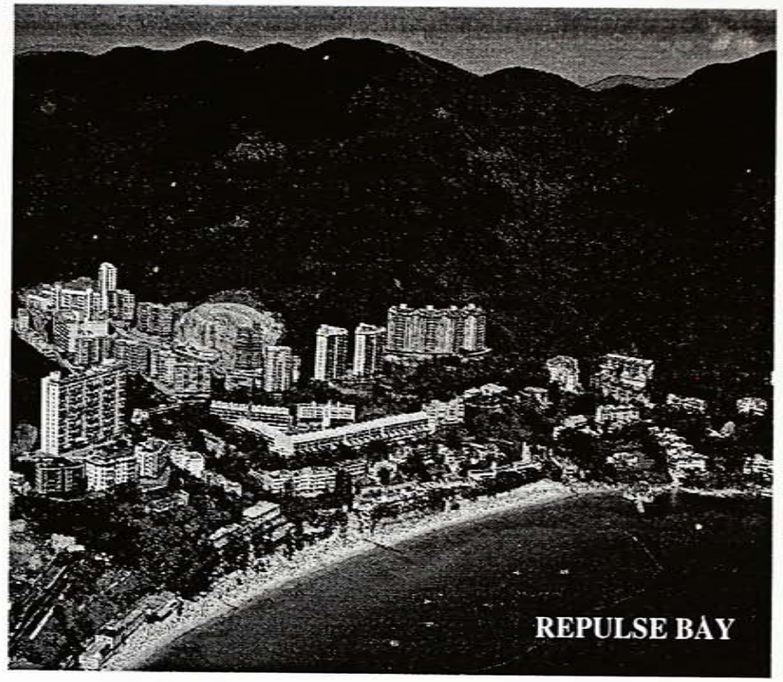
It is also a famous tourist spot in 1995, and its popularity is increasing from 20% in 1990 to 26% in 1995.

ABERDEEN (2.5 MILLION)

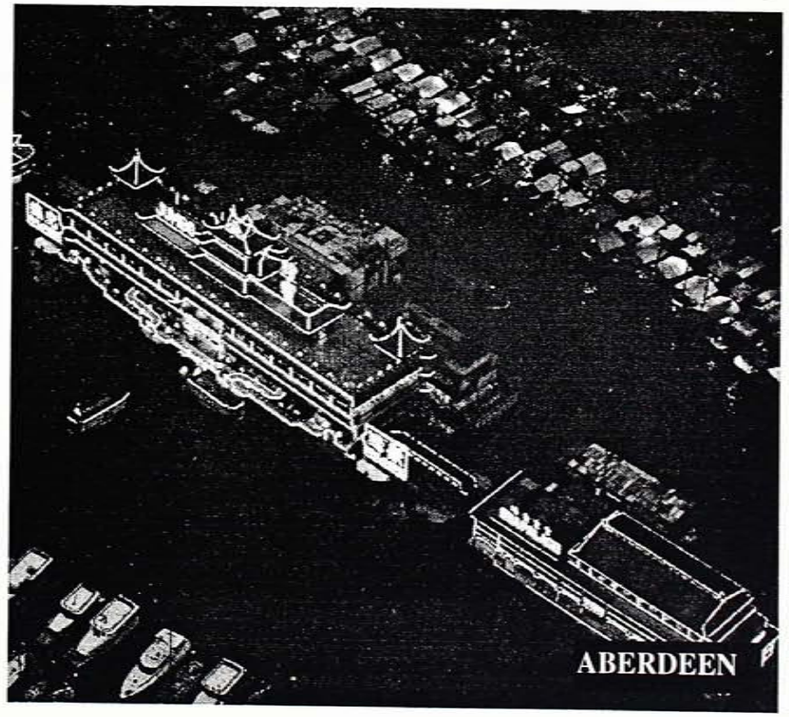
It is the fourth most famous tourist spot in 1995, though its popularity is decreasing from 35% in 1990 to 25% in 1995.

PHOTO CREDITS
A Statistical Review of Tourism 1995, Hong Kong Tourist Association


VICTORIA PEAK


REPULSE BAY


OCEAN PARK

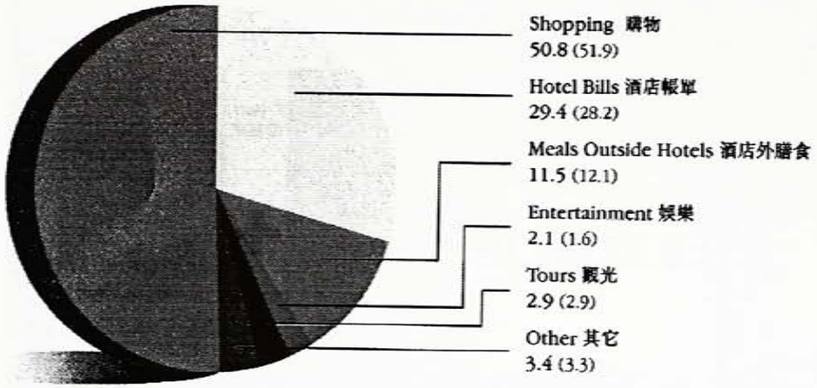

ABERDEEN

4.4
SPENDING PATTERN OF TOURISTS

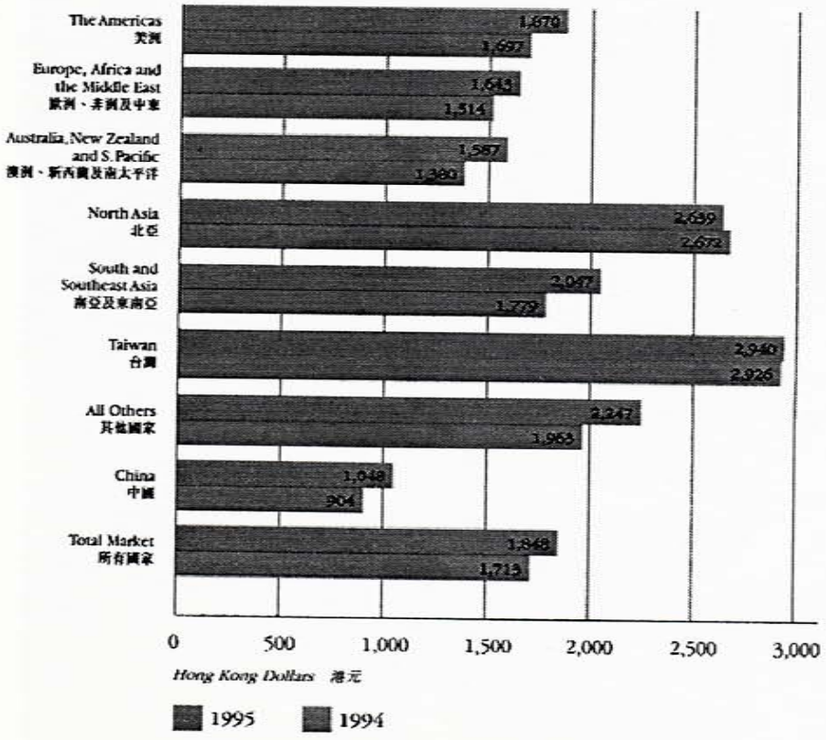
Tourists usually bring money here for their stay. In designing the visitors' centre for Hong Kong, an understanding of their spending pattern is very important in programming the building and the commercial facilities.

From the chart in the right, it shows visitors spends around $ 2,000 per day and half of them are spent on buying things. More than 15% of the money are spent on entertainment and on food. This helps to formulate the facilities given in the building.

PHOTO CREDITS
A Statistical Review of Tourism 1995,
Hong Kong Tourist Association



VISITORS' SPENDING PATTERN

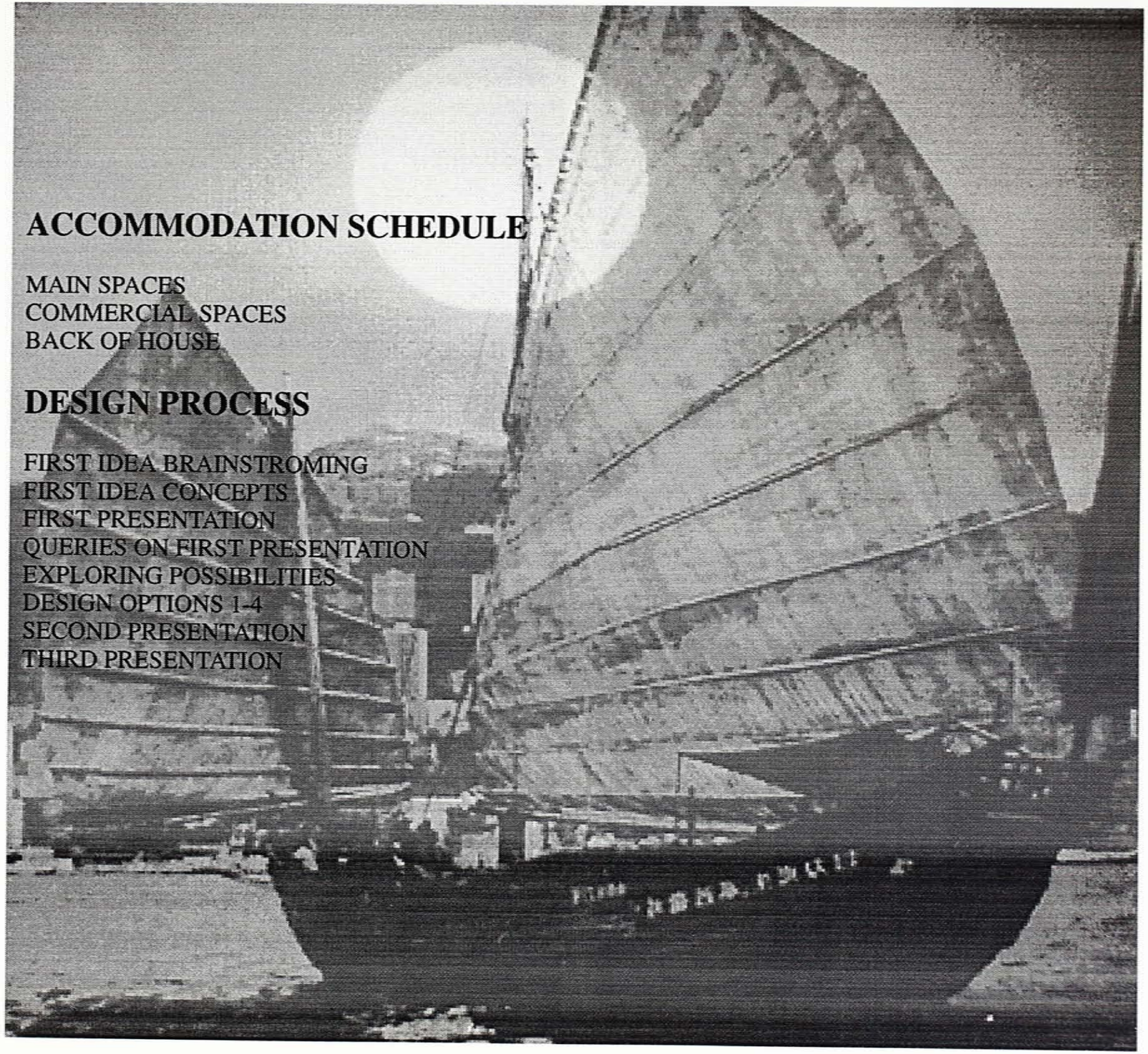


MAJOR MARKET AREAS' VISITORS' SPENDING PER DAY

EXPENDITURE ON MAIN SHOPPING CATEGORIES

PART B

FUTURE STATE



5.1 ACCOMMODATION SCHEDULE - MAIN SPACES

EXHIBITION / CEREMONIAL SPACE
3000s.m.

for any kind of unprogrammed event that can even act as an amphitheatre for opera and platform for viewing fireworks

TOURIST INFORMATION OFFICE
300s.m.

for visitors to be given information of this building and Hong Kong

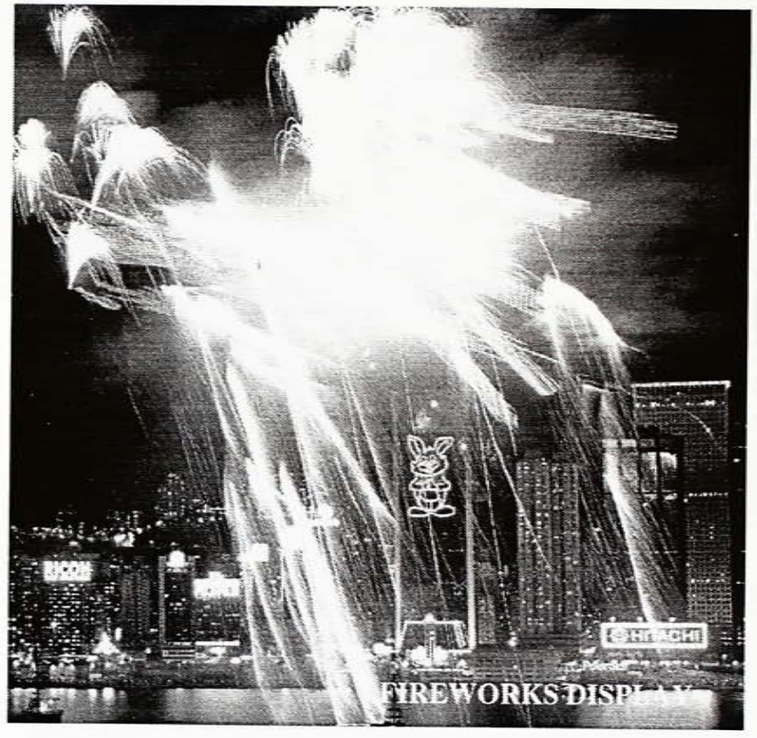
FUNCTION ROOMS
600s.m.

for any firm show or for indoor functional use, sometimes for large scale conference

EXHIBITION BALL ROOMS
400.s.m.
for some business and promotion uses in some special occasions.

PHOTO CREDITS
Ian Buruma, Great Cities of the World -Hong Kong, Formasia


CEREMONIES



FIREWORKS DISPLAY


FUNCTION ROOMS


OPERA HELD

5.2
ACCOMMODATION SCHEDULE - COMMERCIAL SPACES

GIFT / CULTURAL GALLERY
500s.m.

for some special souvenirs and services that is unique to Hong Kong, including Chinese silk, Chinese chops, fortune telling services...

CHINESE CRUISE
1000s.m.

for tourists to taste unique Chinese Dim Sum and sea food cruise in the floating boat environment that is common in the traditional context.

OPEN CAFE / SITTING
800s.m.

for visitors to have a rest and have some snacks and drinks

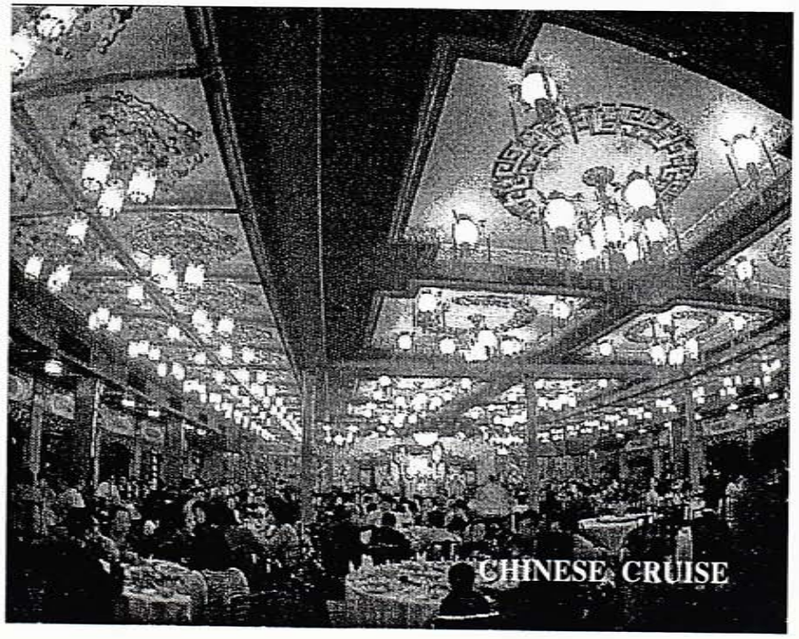
SIGHTSEEING PLATFORMS
500s.m.

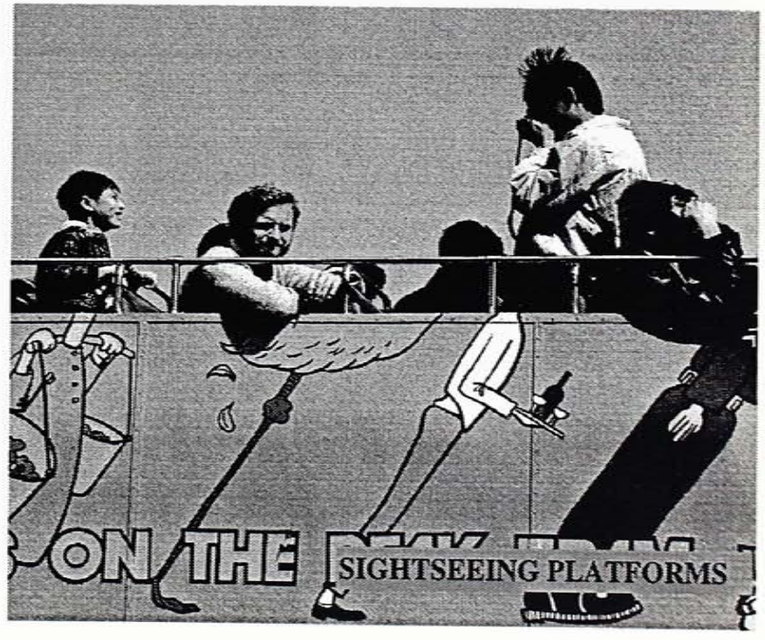
for visitors as a sightseeing platform to view the Harbour

PHOTO CREDITS
Ian Buruma, Great Cities of the World -Hong Kong, Formasia

GIFT SHOPS


FORTUNE TELLER


CHINESE CRUISE


SIGHTSEEING PLATFORMS

5.3 ACCOMMODATION SCHEDULE - BACK OF HOUSE

ADMINISTRATION OFFICE
200.s.m.

for the administrative and security staff of the HKTA working inside

MECHANICAL SPACES
800s.m.

includes sea water pump rooms, diesel power generators, electrical rooms and sewage treatment tanks room

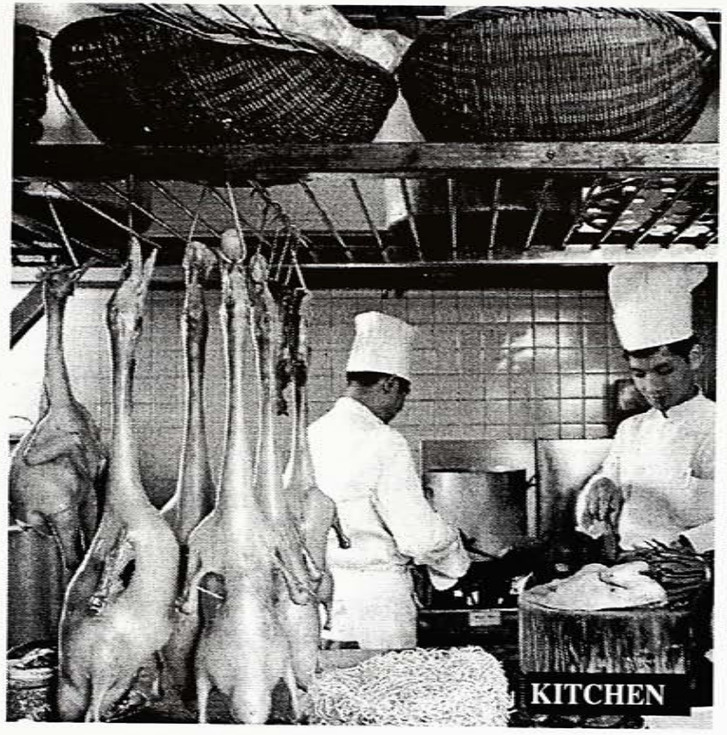
UTILITIES STORAGE
1000s.m.

for the placement of furniture, equipment and some miscellaneous back up storage

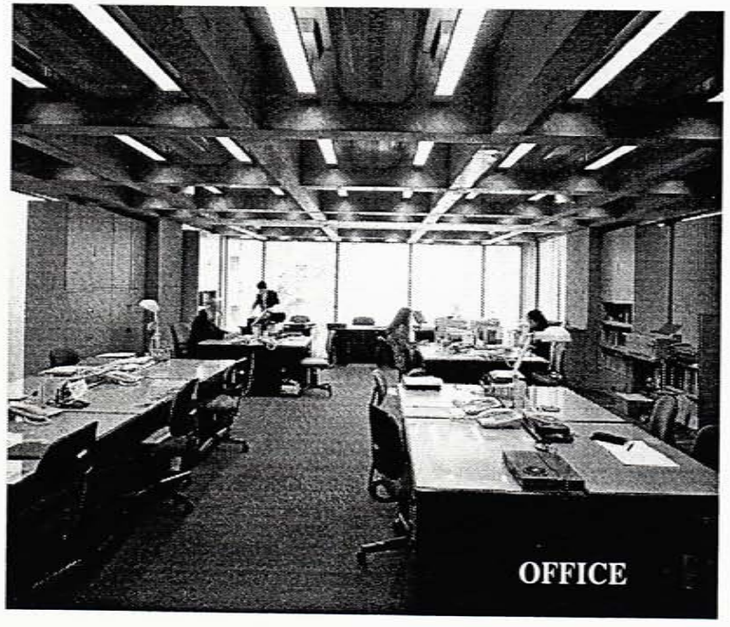
KITCHEN / STORAGE
400.s.m.

cater for the Chinese cruise and open cafe, which is located beside them

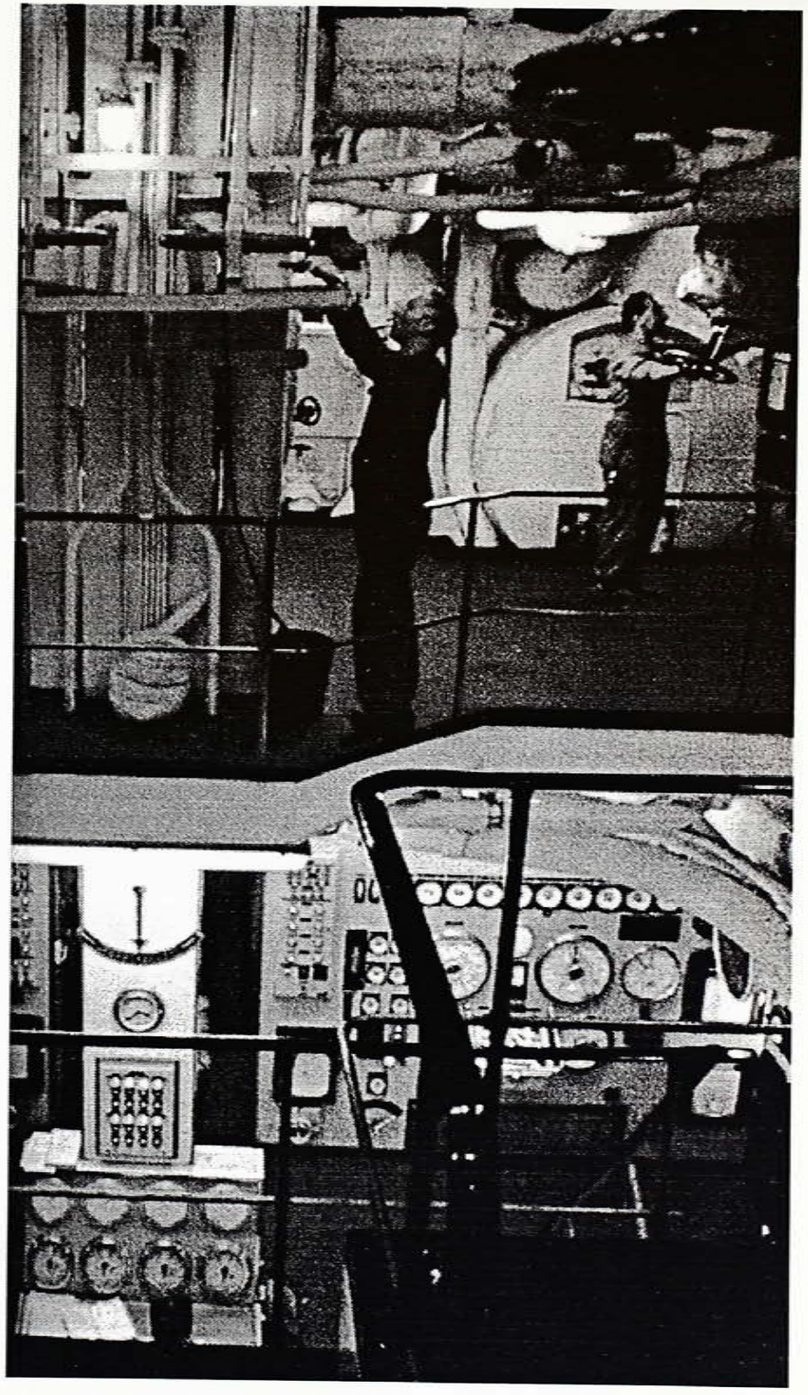
PHOTO CREDITS
Ian Buruma, Great Cities of the World -Hong Kong, Formasia



KITCHEN



OFFICE



6.1
FIRST IDEA
BRAINSTORMING

MID OCTOBER 96

To tackle this design problem. My first approach is to start with the form. It is because the building is, very importantly, act as a landmark for Hong Kong. Therefore, some very simple direct images form the context to some very primary form of the bnature is explored. For example,

A SHIP FORM

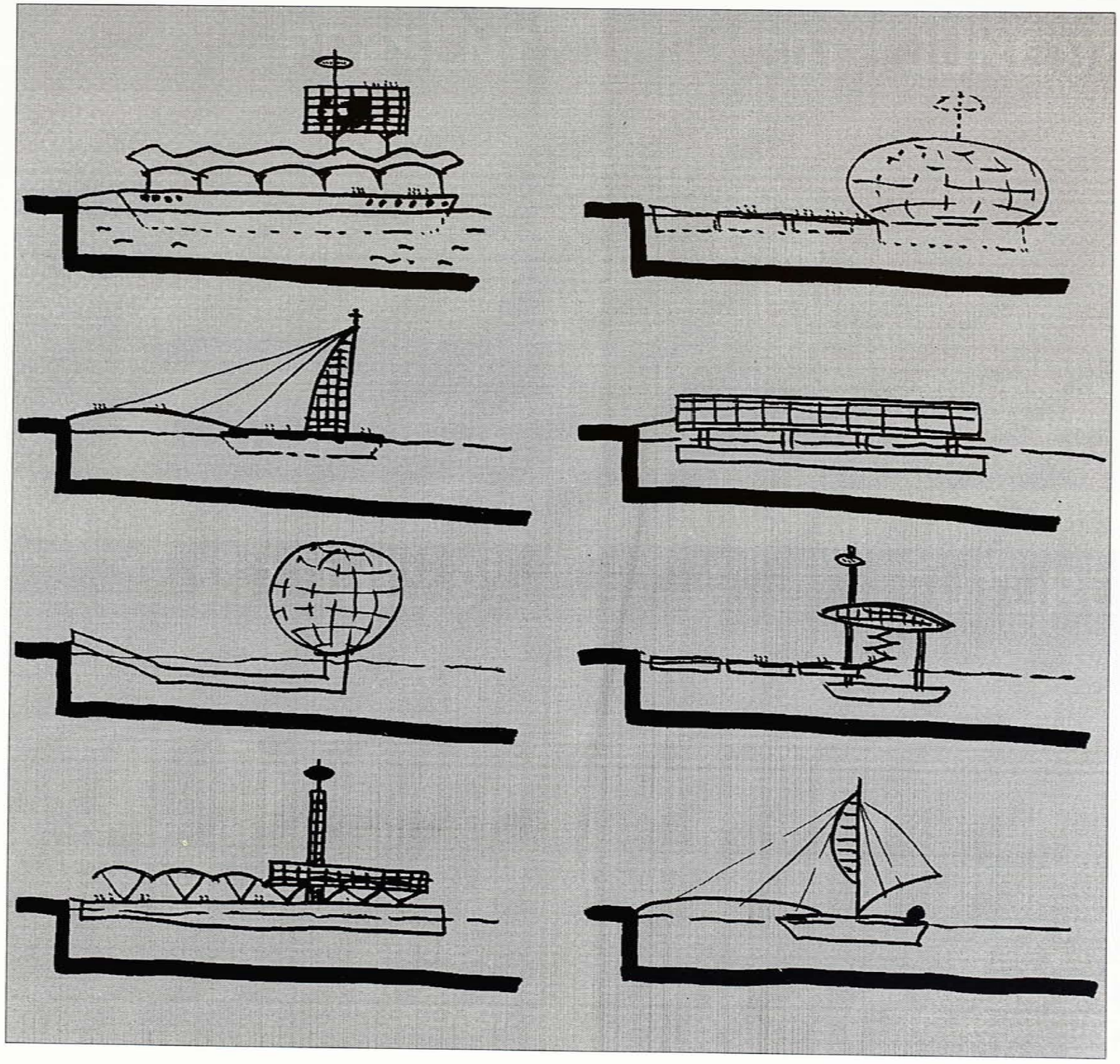
A SAIL BOAT

A SPHERE

A SPACE SHIP

A GLASS TUBE

A CLOUD



6.2
FIRST IDEA CONCEPTS

30TH OCTOBER 96

My primary thinking on the design is on the time dimension. As one advantage of the building is it is moveable. It can be work as a time node. Therefore, for basic time node is studied. They are:

PRESENT

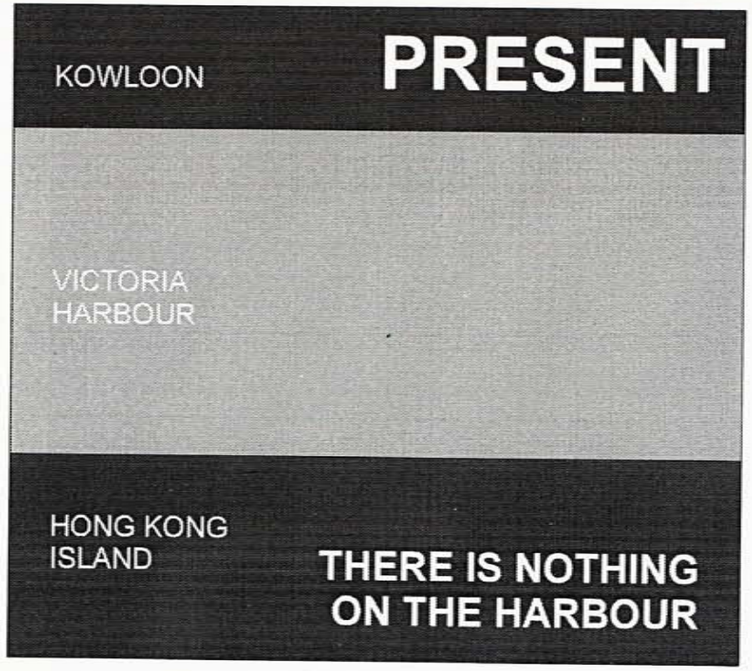
30TH JUNE, 97

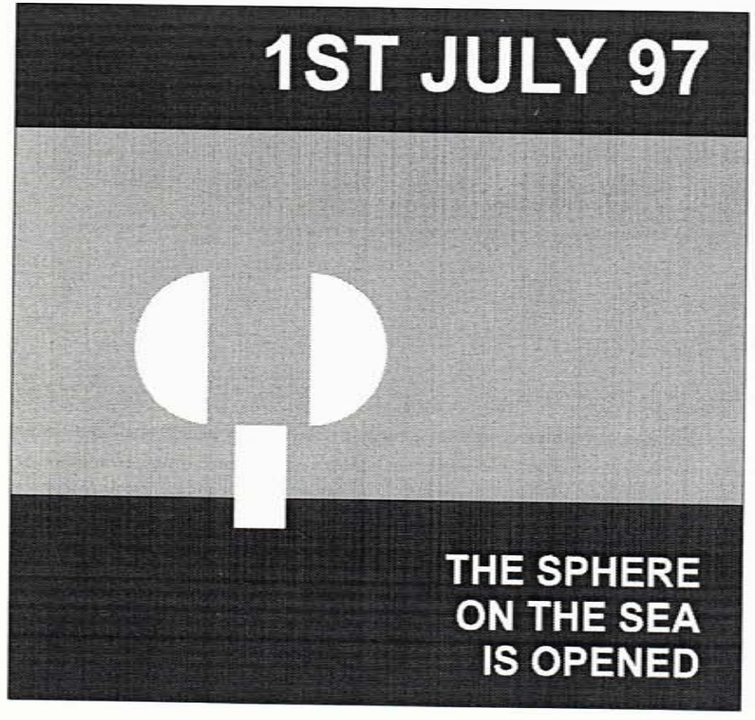
1ST JULY, 97

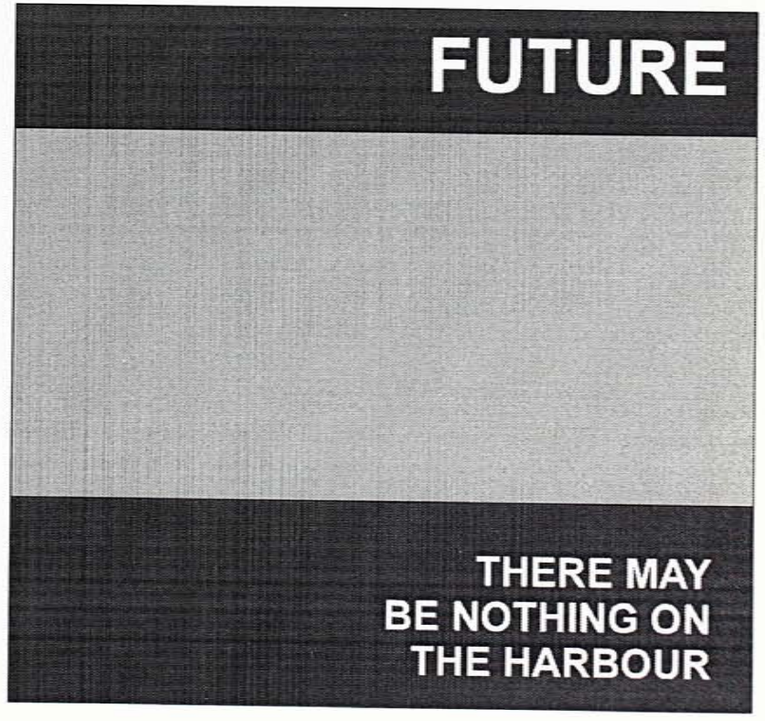
FUTURE

Basically, what I perceive in the current situation, there are nothing on the water surface. However, later, especially on the handover day, the building can appear on the Harbour. Then, on the ceremony, the enclosure can be opened and serve for the ceremony.

However, in the future, the building can be moved to anywhere else so that the building can be relocated to some location that are more meaningful. For example, in the Exposition period, the building can be towed there as a pavilion to represent Hong Kong







plan ?

6.3
FIRST PRESENTATION - CONCEPT SKETCH

30 OCTOBER 96

The developments of the concept sketches is very important and it shows how the scheme of the project is dealt with different issues and aspects in design. In this first presentation, concepts are focused on 9 areas:

SHIPBUILDING CONCEPT

FORM AND STRUCTURE

ZONING

CIRCULATION

TWO FORM SKIN

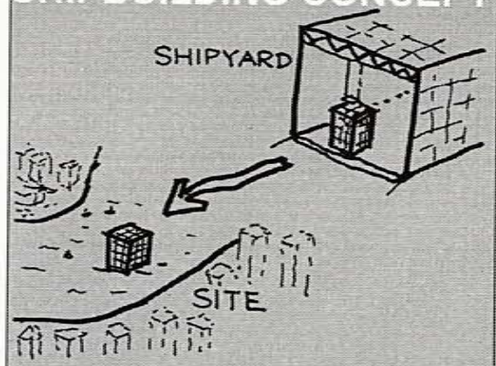
DAY TIME ENCLOSURE

NIGHT TIME CASE

SERVICE

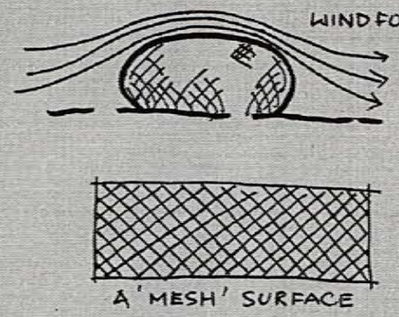
MOBILITY

SHIPBUILDING CONCEPT



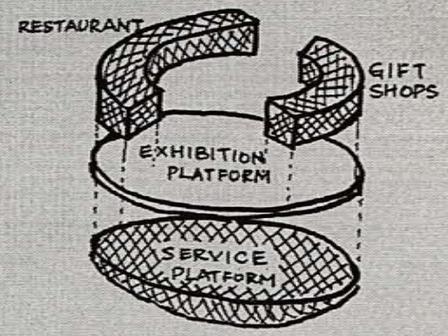
BUILDING BUILT IN SHIPYARD AND THEN TRANSFER TO THE SITE

FORM AND STRUCTURE



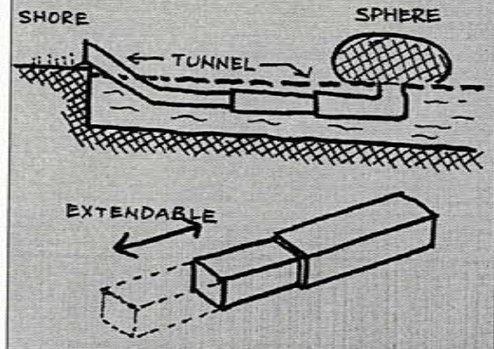
A WATER DROPLET DOME WITH "MESH" IS AN AERODYNAMIC FORM SOFTEN WIND FORCES

ZONING



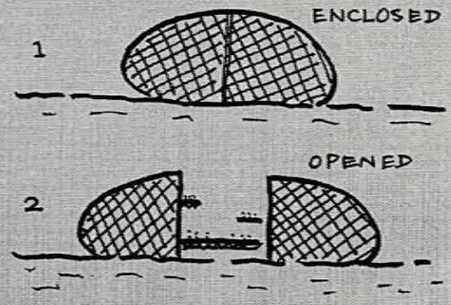
FUNCTIONS GROUPED INSIDE THE SPHERE

CIRCULATION



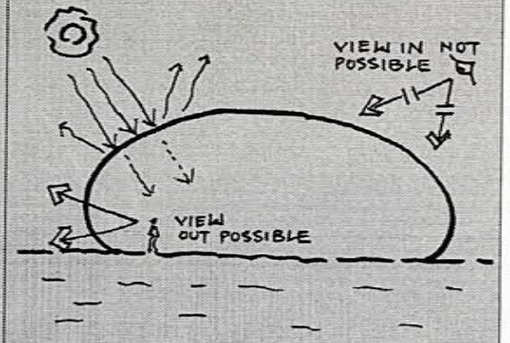
TELESCOPIC TUNNEL CONNECTS THE SHORE TO THE SPHERE

TWO FORM SKIN



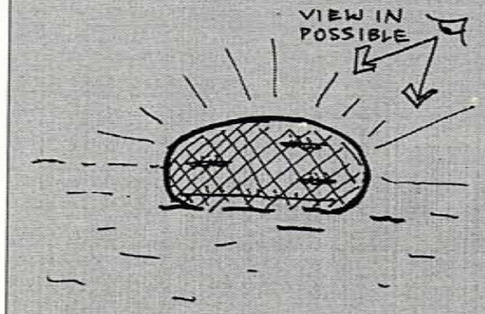
THE SKIN CAN BE ENCLOSED AND OPENED FOR DIFFERENT USES

DAYTIME ENCLOSURE



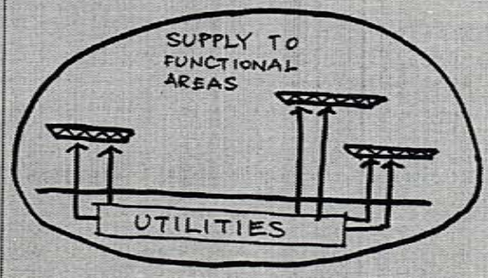
DARK REFLECTIVE GLASS IS USED FOR REFLECTING SUNLIGHT

NIGHT TIME CASE



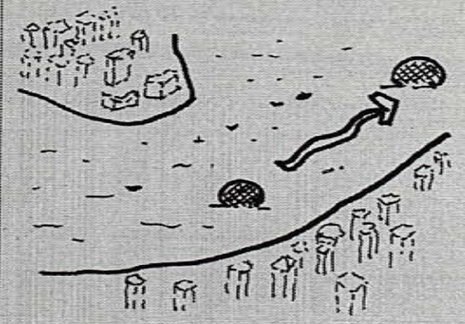
THE SKIN DISSOLVES AND BECOMES A LANTERN FLOATING ON THE SEA

SERVICE



LIKE A CRUISE SHIP, ALL THE UTILITIES ARE STORED INSIDE

MOBILITY



THE WHOLE OBJECT CAN BE TRAVELLED TO OTHER PLACES

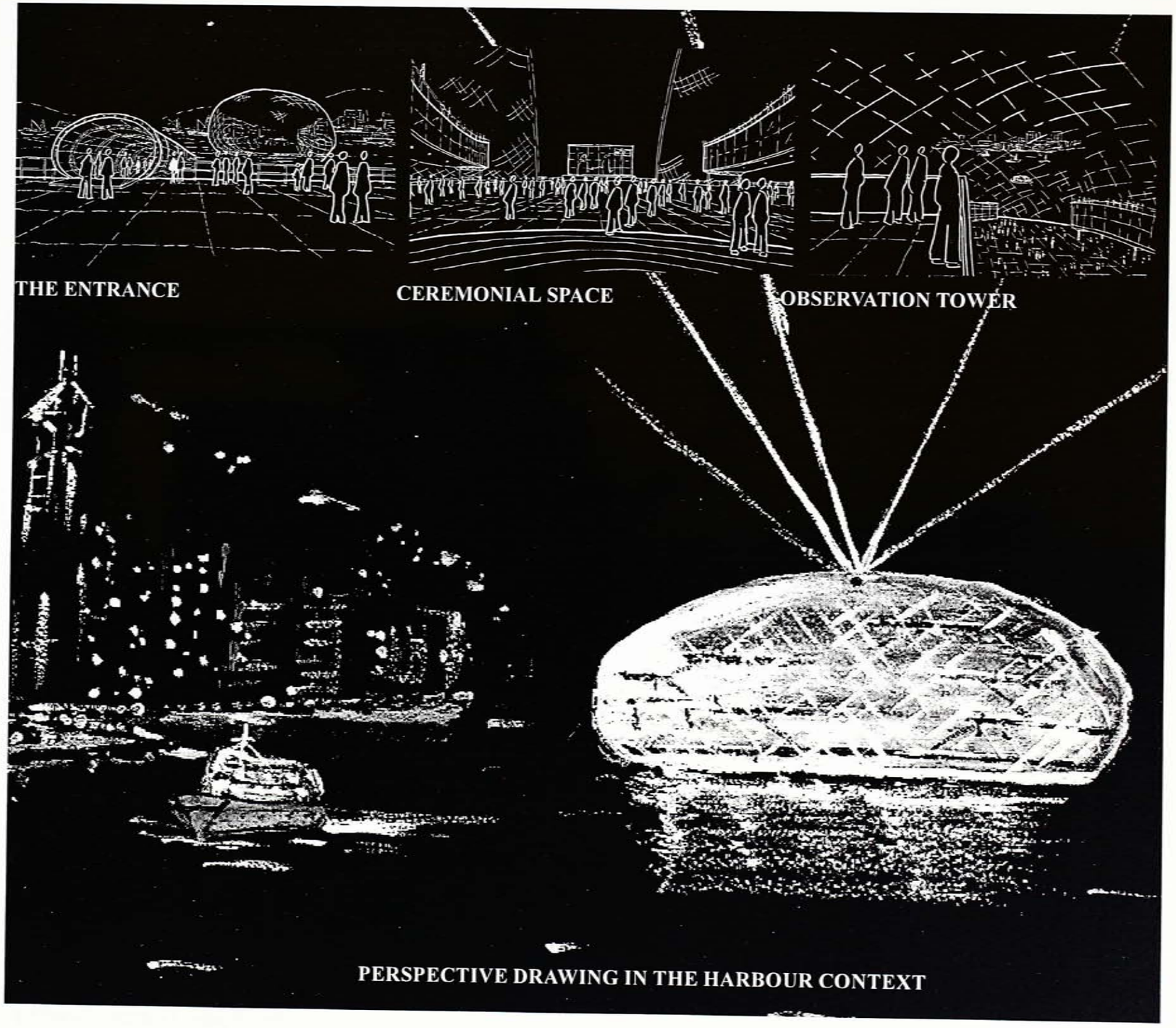
6.4
FIRST PRESENTATION - SKETCHES

EXTERIOR PERSPECTIVES

This major drawing is drawn in the context of the Victoria Harbour. The building is basically composed of two skins. The external skin looks like a water droplet. This skin is openable so that the internal spaces can be made exterior.

OTHER SKETCHES

The first sketch shows the tunnel entrance is at the shore with the building behind. The second one is an interior sketch of the exhibition / ceremonial spaces with an openable roof covering above. The third sketch shows the observation tower viewing below and the Victoria Harbour outside.



6.5
FIRST PRESENTATION - DRAWINGS

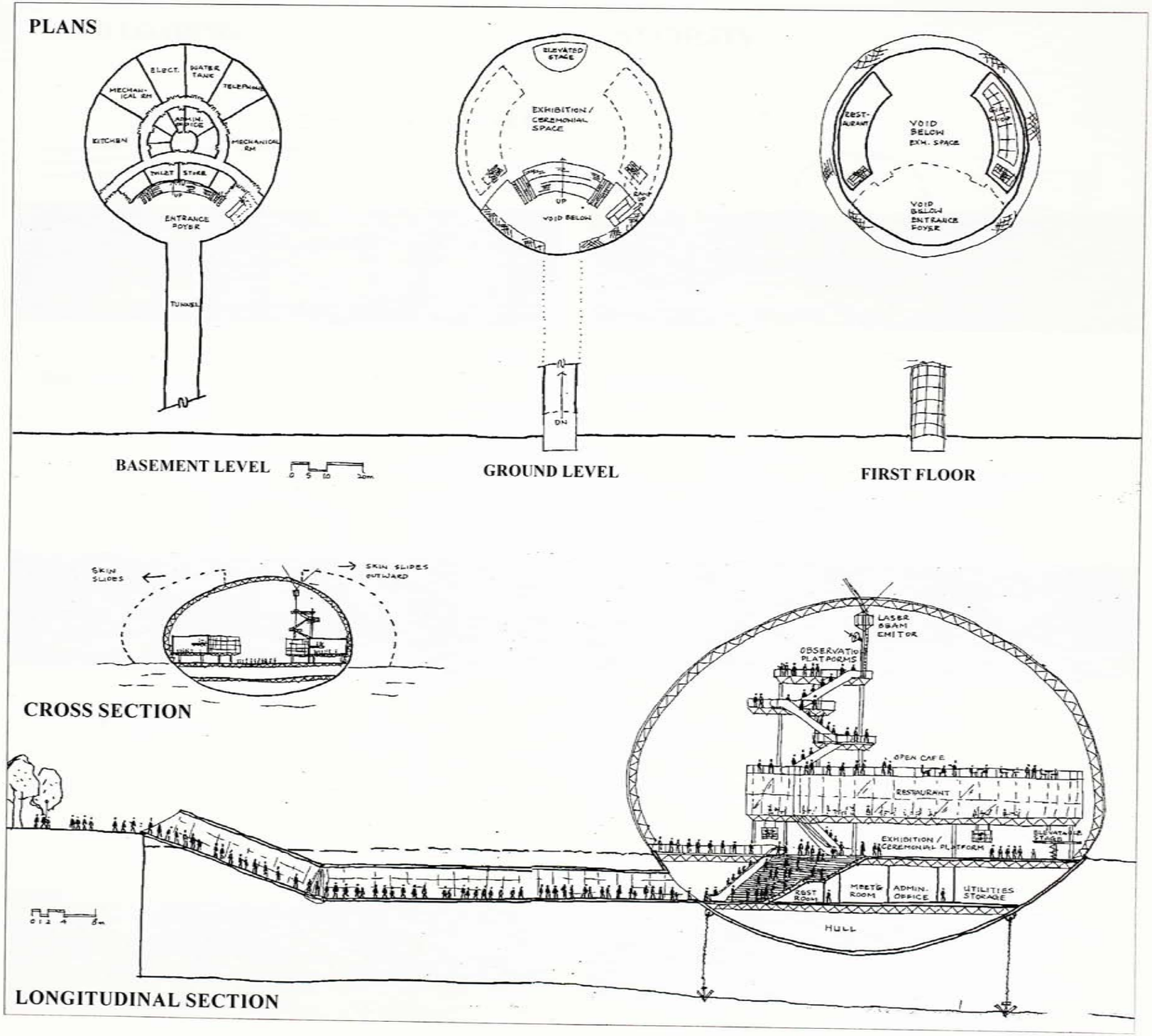
In the presentation, other drawings such as plans and sections are done.

PLANS

It is the first concept on organizing the spaces. Basically, there are three levels in plan. The basement level is where the visitors arrive. Therefore, there is an entrance foyer with information counters. Behind the foyer space is the service spaces with M&E rooms and administration spaces. The visitors are directed to the ground level, the exhibition / ceremonial spaces. From there, visitors can have a choice to the two building blocks which one consists of restaurants and cafes and the other the gift gallery and observation platforms.

SECTION

The section shows the solution how the building is connected from the shore to it by a tunnel. It also shows the double enclosure of the building which the outer one is openable.



6.6
QUERIES ON FIRST PRESENTATION

In the presentation, critics queries about the form. They agures the form should answer the questions of the following issues.

WIND LOADING

STABILITY

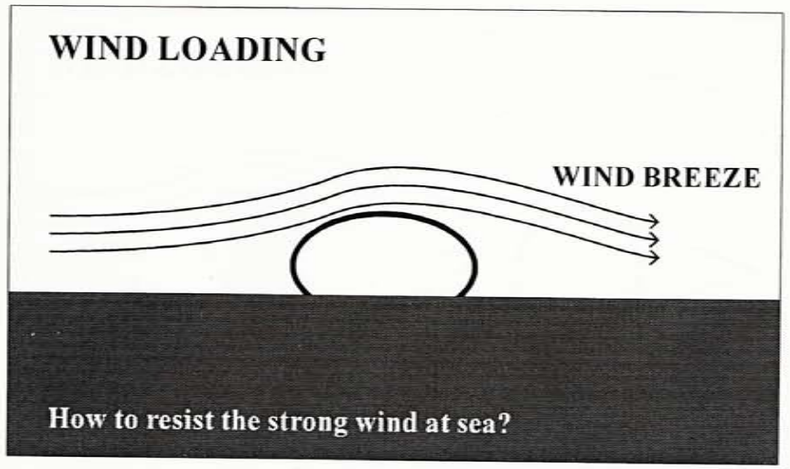
SOLAR GAIN

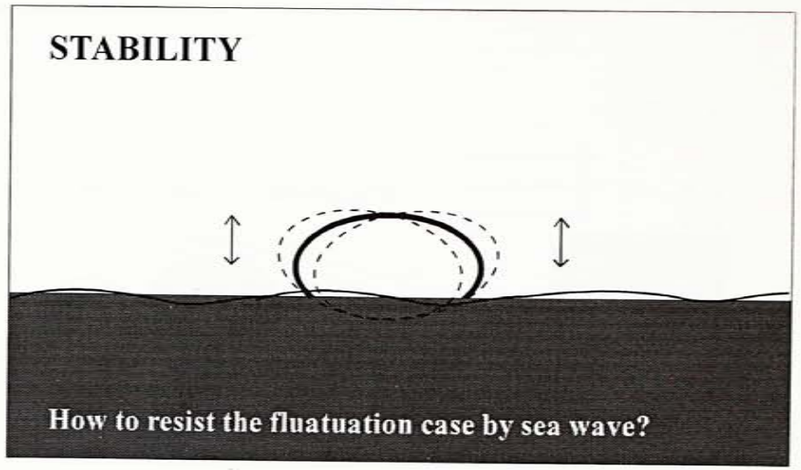
VIEW OUT

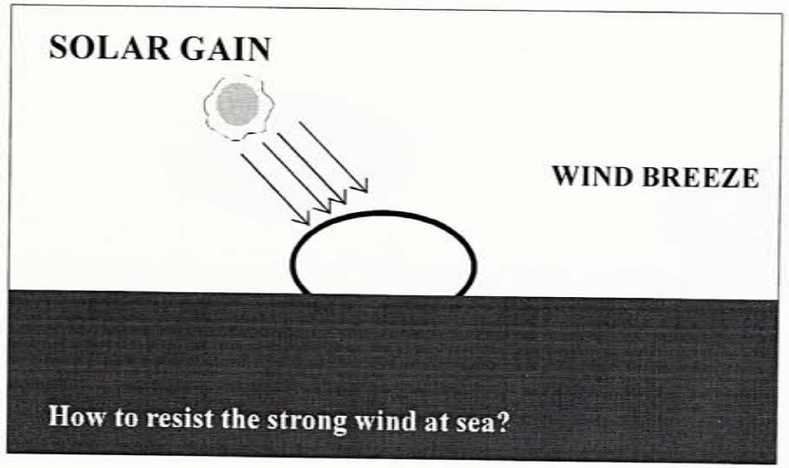
CIRCULATION FROM THE SHORE TO THE BUILDING

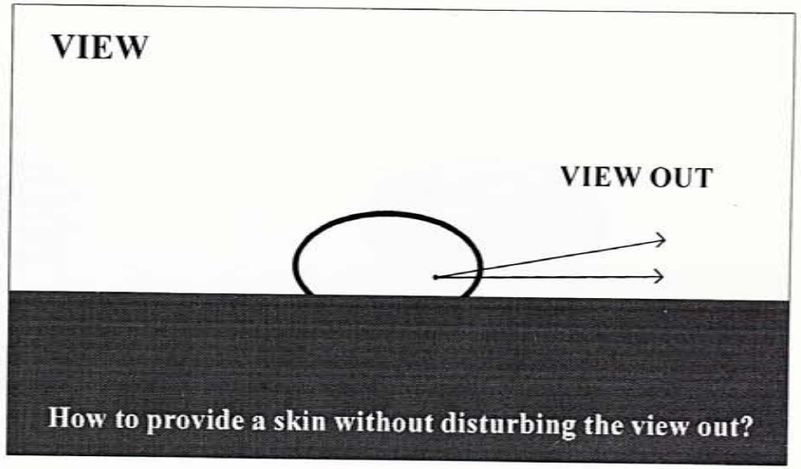
INDOOR / OUTDOOR ENCLOSURE

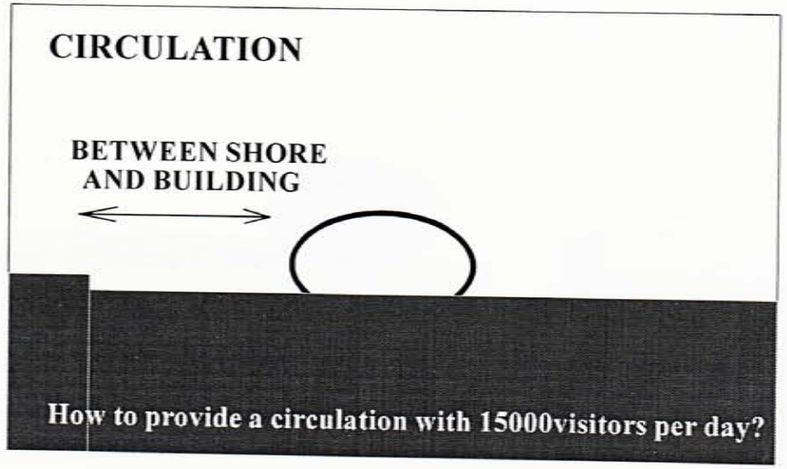
In this thesis, the architectual solution should satisfy all these requirements using technology!

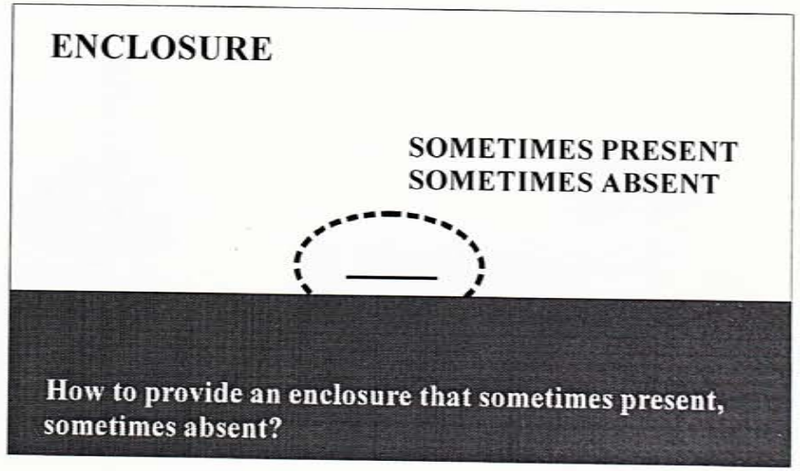












6.7 EXPLORING POSSIBILITIES -1

To solve the queries in the previous pages, a section is done on finding all the possible answers to these problems.

WIND LOADING

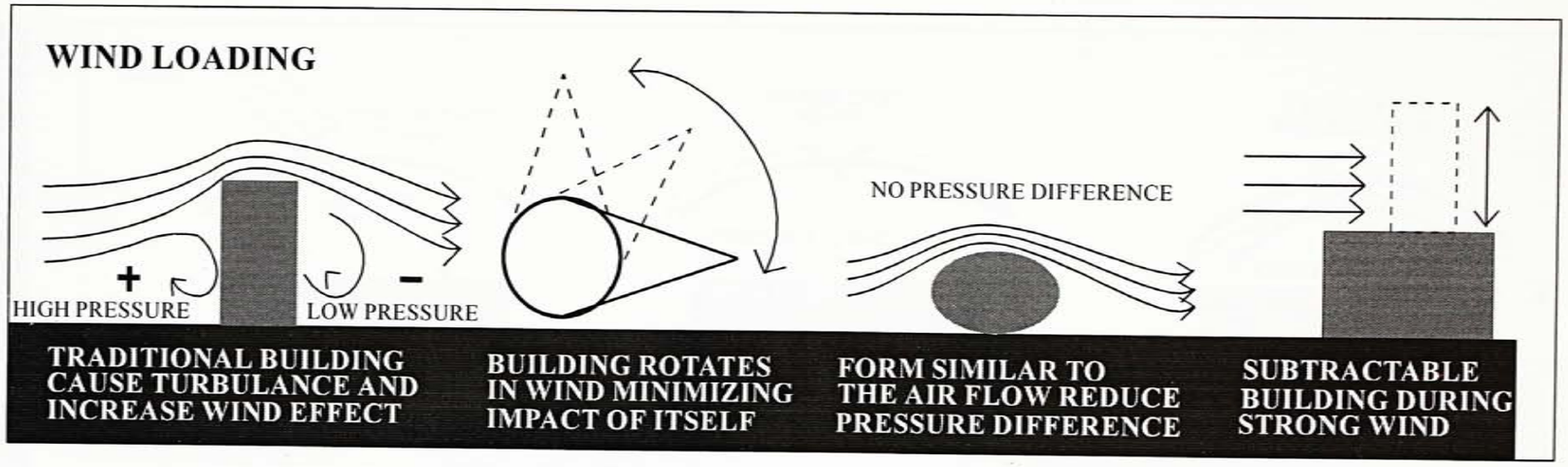
As this building is located at the middle of the sea without concrete foundations, the building itself should minimize the effect of wind to the building. Traditional rectangular building form may not be the answer for this issue. Therefore, some engineering concepts may be employed.

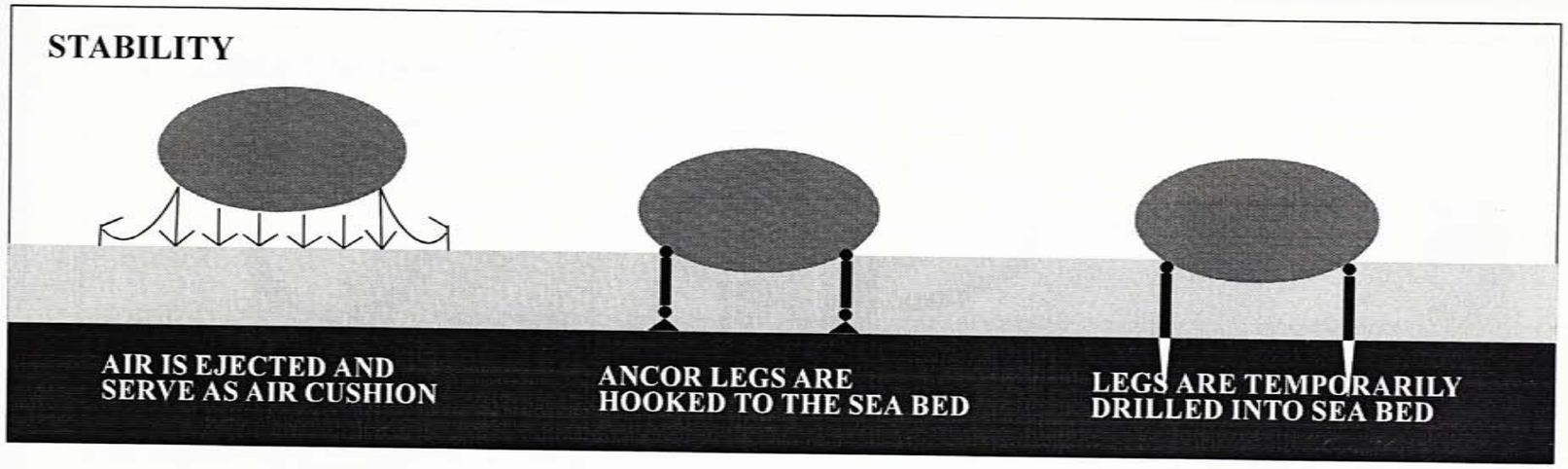
STABILITY

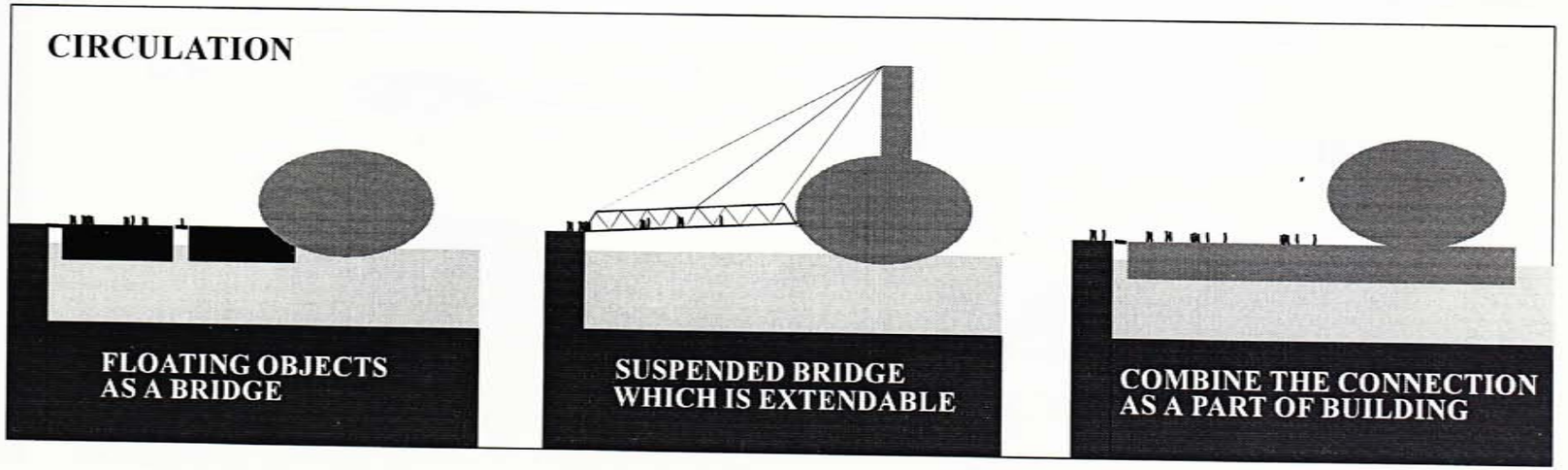
As the building is floating on a sea with strong sea waves, how to stabilize it is very important. Some mechanical forces may be needed in this case.

CIRCULATION

This building is estimated to have 15000 visitors per day. To provide a circulation to serve that volume is very challenging. Ideas on the structure and the nature of the connection should be thought.







6.8 EXPLORING POSSIBILITIES -2

SUN

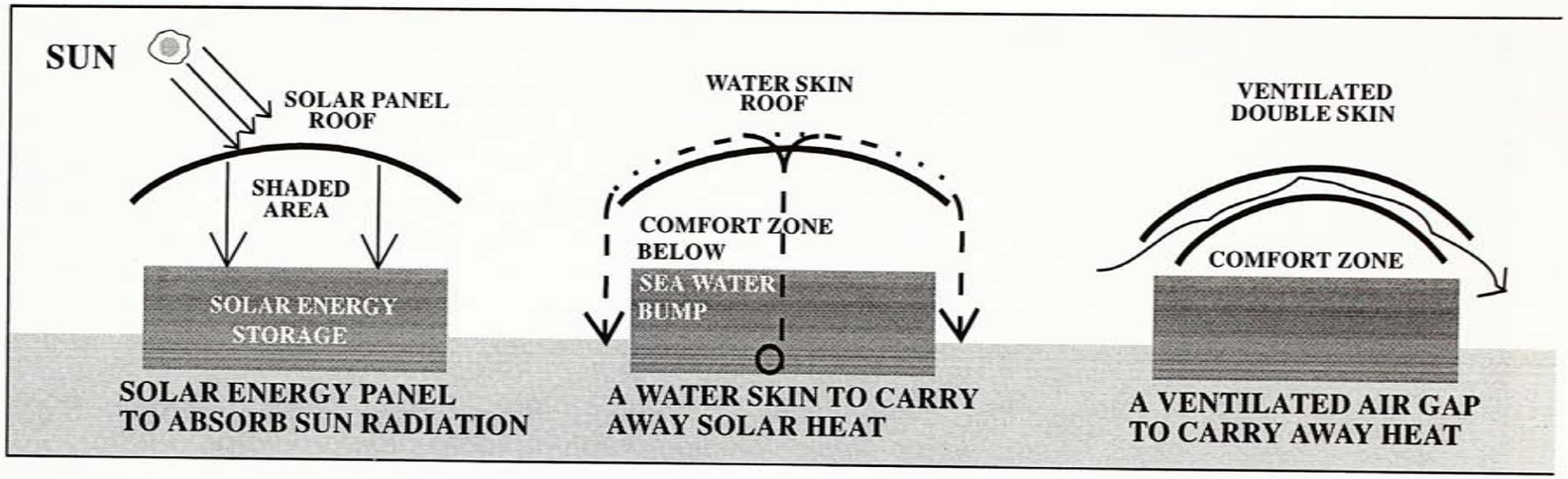
In Hong Kong, the solar radiation is very high. Therefore, to cerate a better interior atmosphere, strategies dealing with sun shading is crucial. As sun radiation is a very powerful, solutions may utilitze it as a means of energy source.

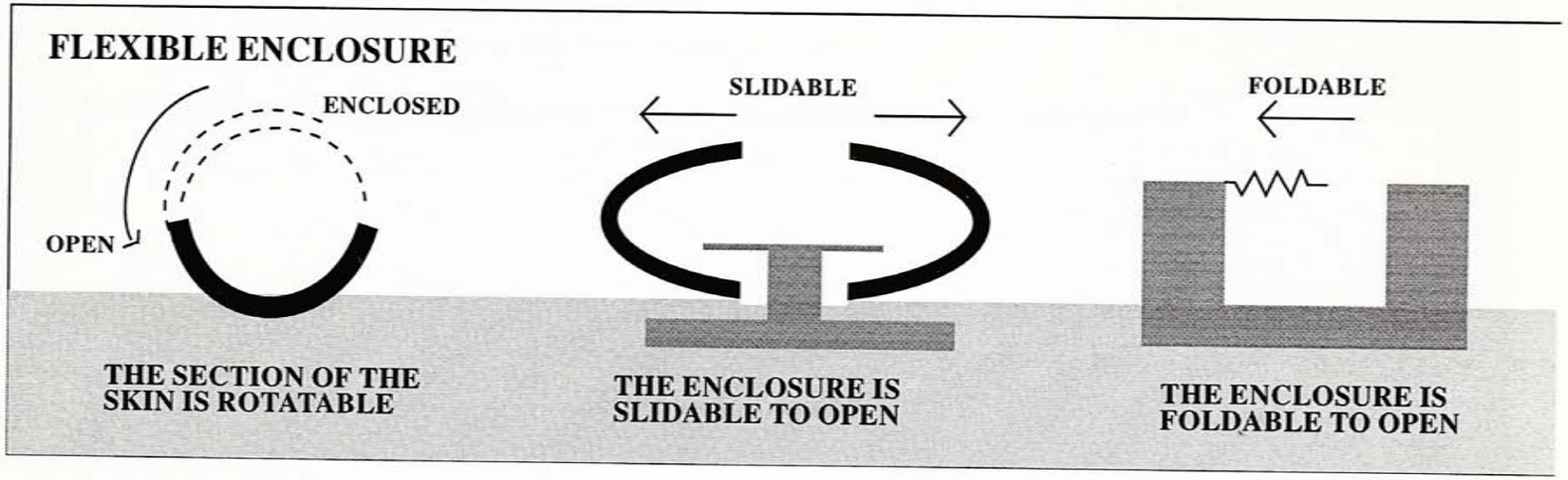
FLEXIBLE ENCLOSURE

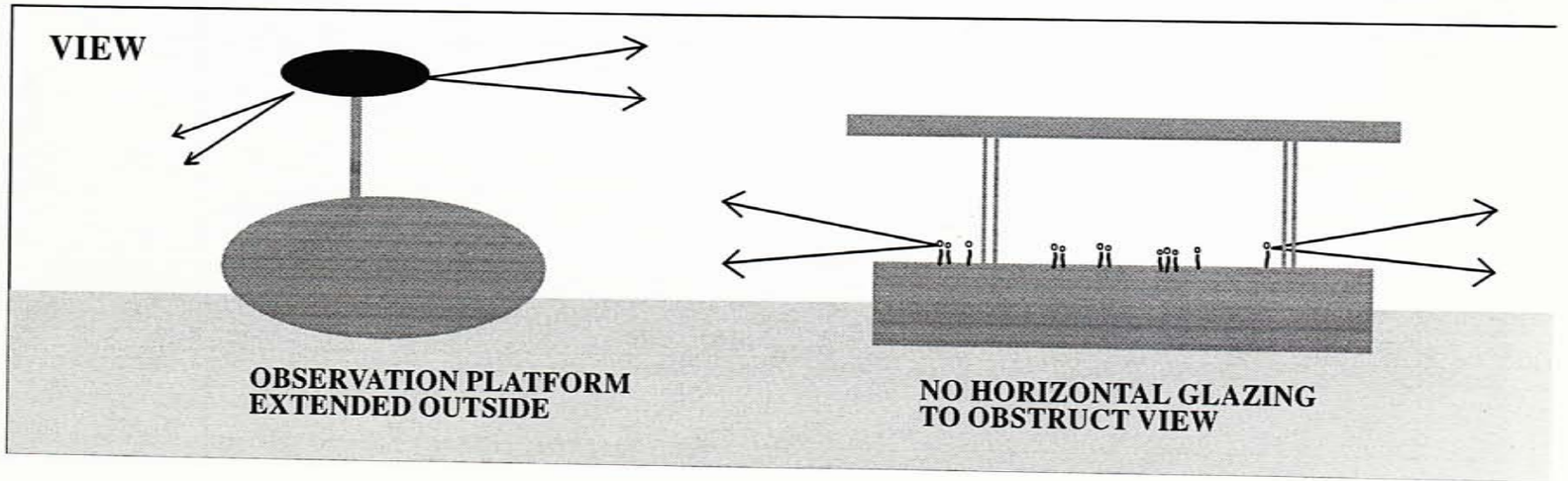
As one of the most important function of the building is to hold ceremonies and performance and even usesd to view annual fireworks, the ceremonial space is better to have a flexible configuration as well as a flexible enclosure to achieve all these needs. In other words, sometimes the enclosure may be present but sometimes it may disappear.

VIEW

The building is mainly used by tourists who have an interest to the well varying Harbour context. Therefore, an appropriate physical







6.9
DESIGN OPTIONS -1

MID NOVEMBER

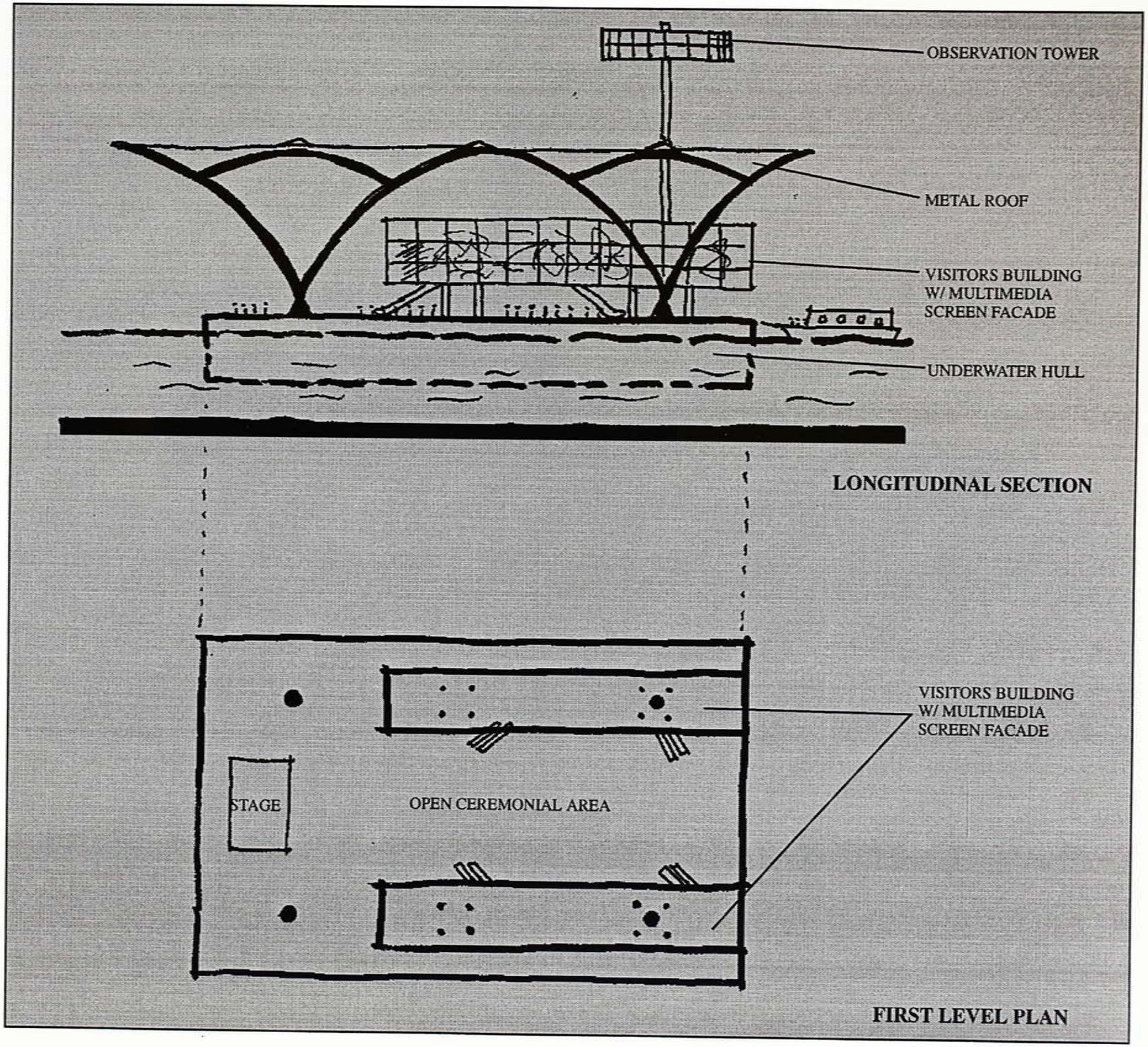
This is a very simple design with a basic hull and a big steel roof covering the multi functional area. The area do not have much configuration to increase the flexibility. There is a building block accommodating all the visitors' spaces. The facade is a multimedia screen so that all the activities can be shown on it. All the services and utilities are placed inside the hull as they need not have view. Moreover, there is an observation tower bulging above the big roof.

PROS

* Simple design and easy and cheap construction
* Good zoning to separate functional and service spaces
* Unobstructed view to outside
* Integrated facade with multimedia screen

CONS

* Roof hard to be operable
* Form not pop up in the context
* Arrival port not well addressed



6.10
DESIGN OPTIONS -2

MID NOVEMBER

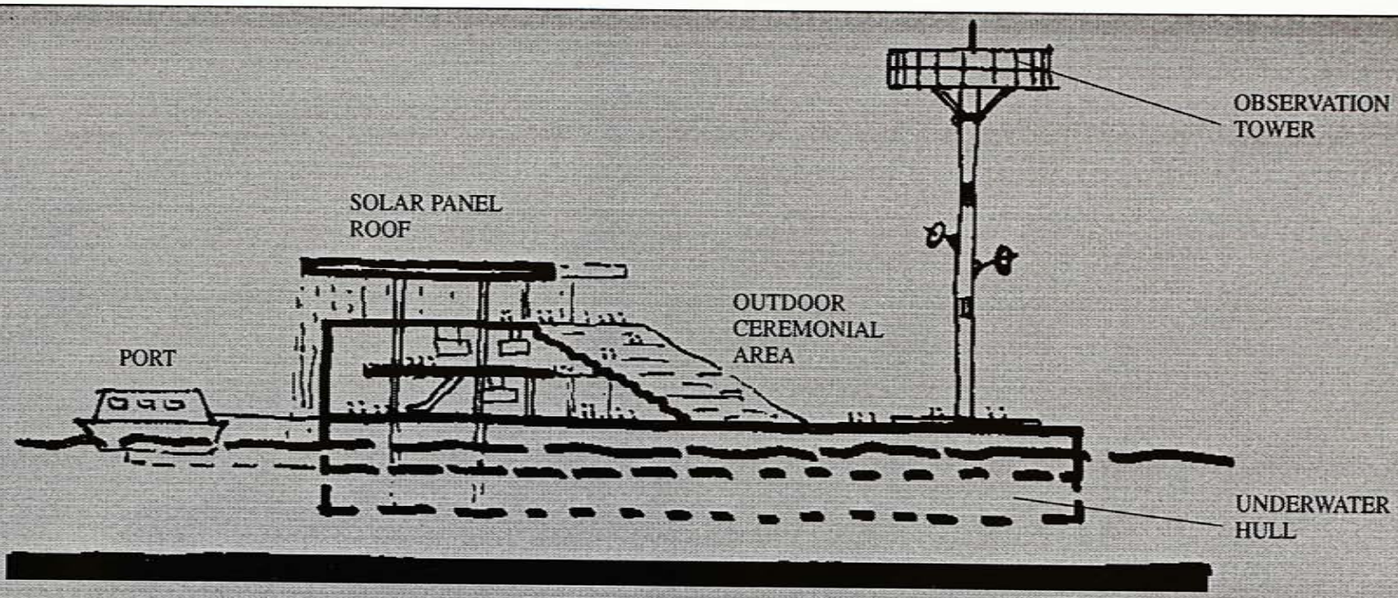
In this option, a partially covered roof is used and the roof contains solar panels to collect solar energy. The open performance area is uncovered with a circular sitting area is formed by the sloping building. The zoning is similar to option 1 except the observation tower is located far from the visitor's space.

PROS

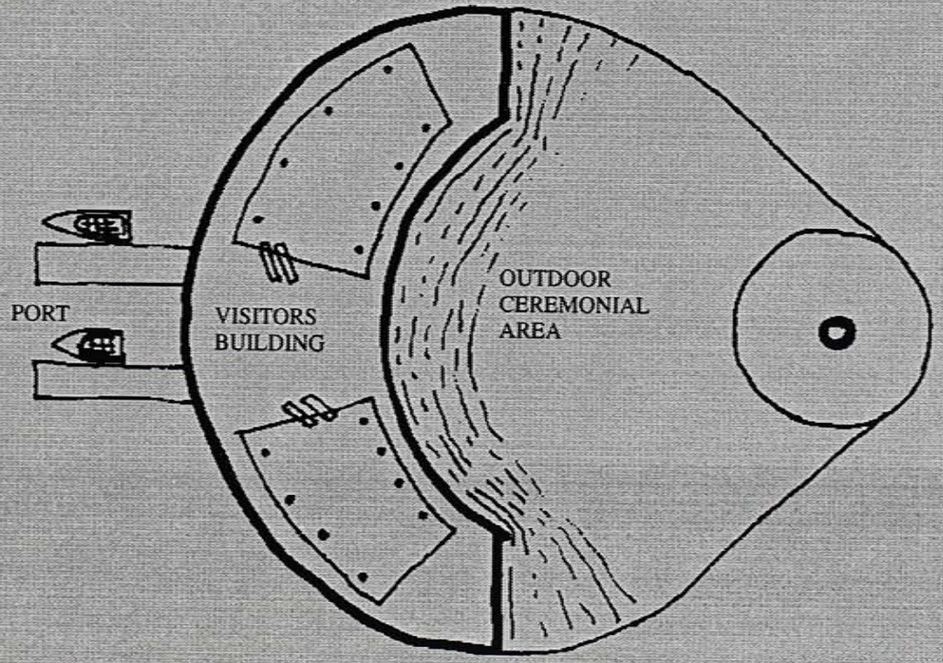
* Setting of the outdoor area more suitable for performance use
* good integration between inside building and outside space

CONS

* Arrival port not welcoming
* Observation tower too far from visitors' space
* Form not pop up in the context
* Performance area not covered
* Performance area not flexible



LONGITUDINAL SECTION



FIRST LEVEL PLAN

6.11
DESIGN OPTIONS -3

MID NOVEMBER

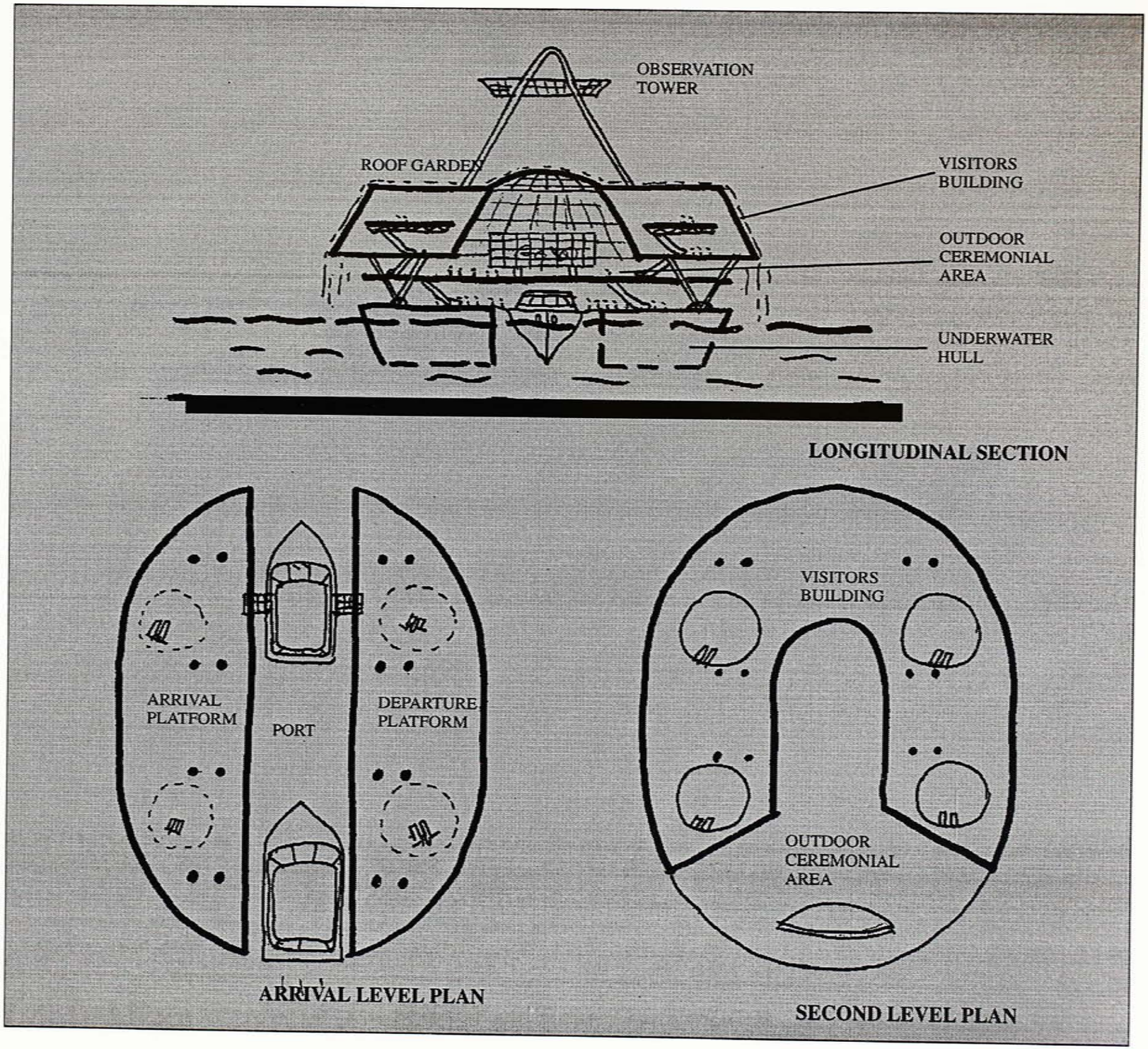
This option is come from the technical study on a stable ship design. The plan is an oval shape with 2 hulls. This increase the stability of the ship. The gap between the hulls are the arrival and departure port and the arrival and departure visitors are separated. Te building above the outdoor area are in "U" shape so that it creates shading on the area.

PROS

* Stable building form
* Good circulation system
* Effective shading device for the outdoor space

CONS

* Arrival port well addressed
* Form not elegant
* Outdoor area less sunlight
* problem on vertical circulation to the observation tower



6.12
DESIGN OPTIONS -4

MID NOVEMBER

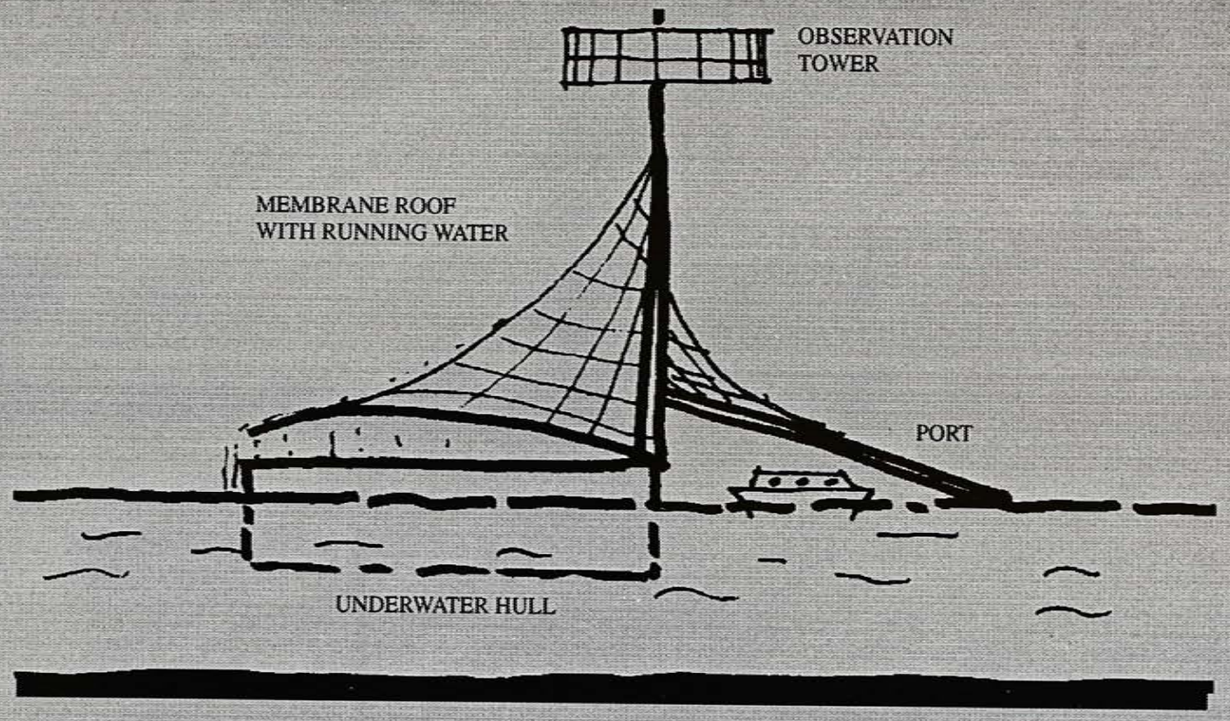
This design is actually a membrane structure design covering the whole building. A vertical post holds the roof and creates the structure of the observation tower. Sea water is pumping along the post and running down again along the membrane roof to create a water cooling layer. The visitors building and all service spaces are placed underneath the roof.

PROS

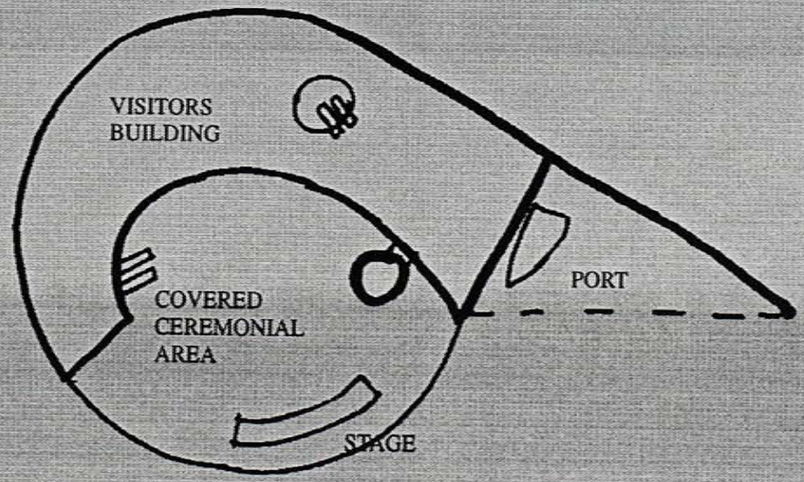
* Form more elegant and less obstruct to context
* well address entrance for the ferry
* Good use of water

CONS

* Structure hard to construct
* Enclosure hard to be operable
* Design of port is not good



LONGITUDINAL SECTION



FIRST LEVEL PLAN

6.13
SECOND PRESENTATION CONCEPTS

22TH NOVEMBER

In this presentation, new concepts are applied to the scheme in the following issues.

CIRCULATION

VIEW

SKIN

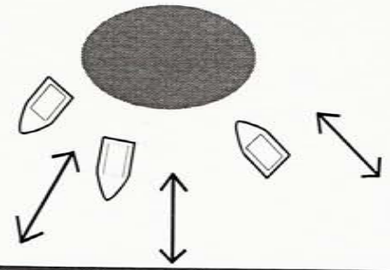
WIND

SUN

STABILITY

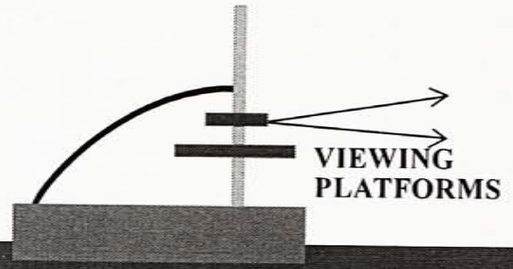
In this design development stage, the technology is assumed to perform these concepts.

CIRCULATION



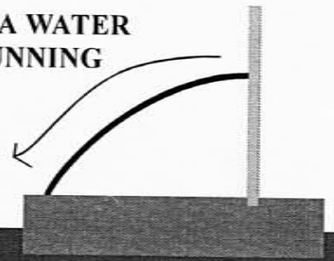
BOATS ARE TRAVELLING BETWEEN THE BUILDING AND THE SHORES

VIEW



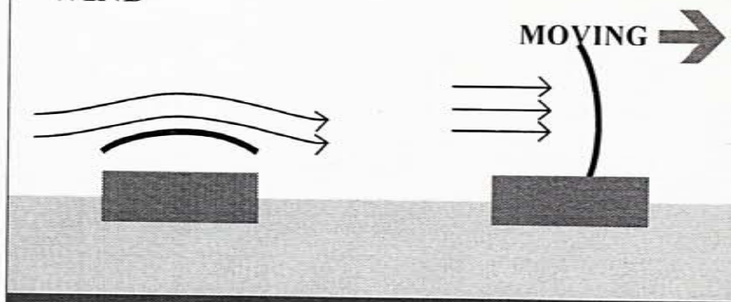
SUSPENDED OBSERVATION PLATFORMS ARE CREATED TO PROVIDE SAPCES FOR VIEWING

SKIN



SEA WATER IS PUMBED AND RUN ALONG THE SKIN CREATING A COOLING EFFECT

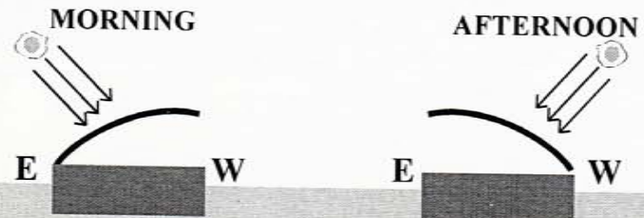
WIND



HORIZONTAL FORM LESSEN WIND IMPACT

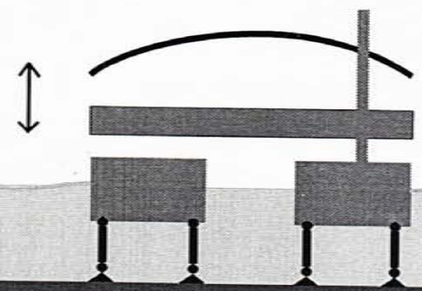
VERTICAL FORM ACT AS A SAIL

SUN



THE ENCLOSURE IS ROTATABLE TO DEAL WITH THE ROTATING SUN PATH

STABILITY



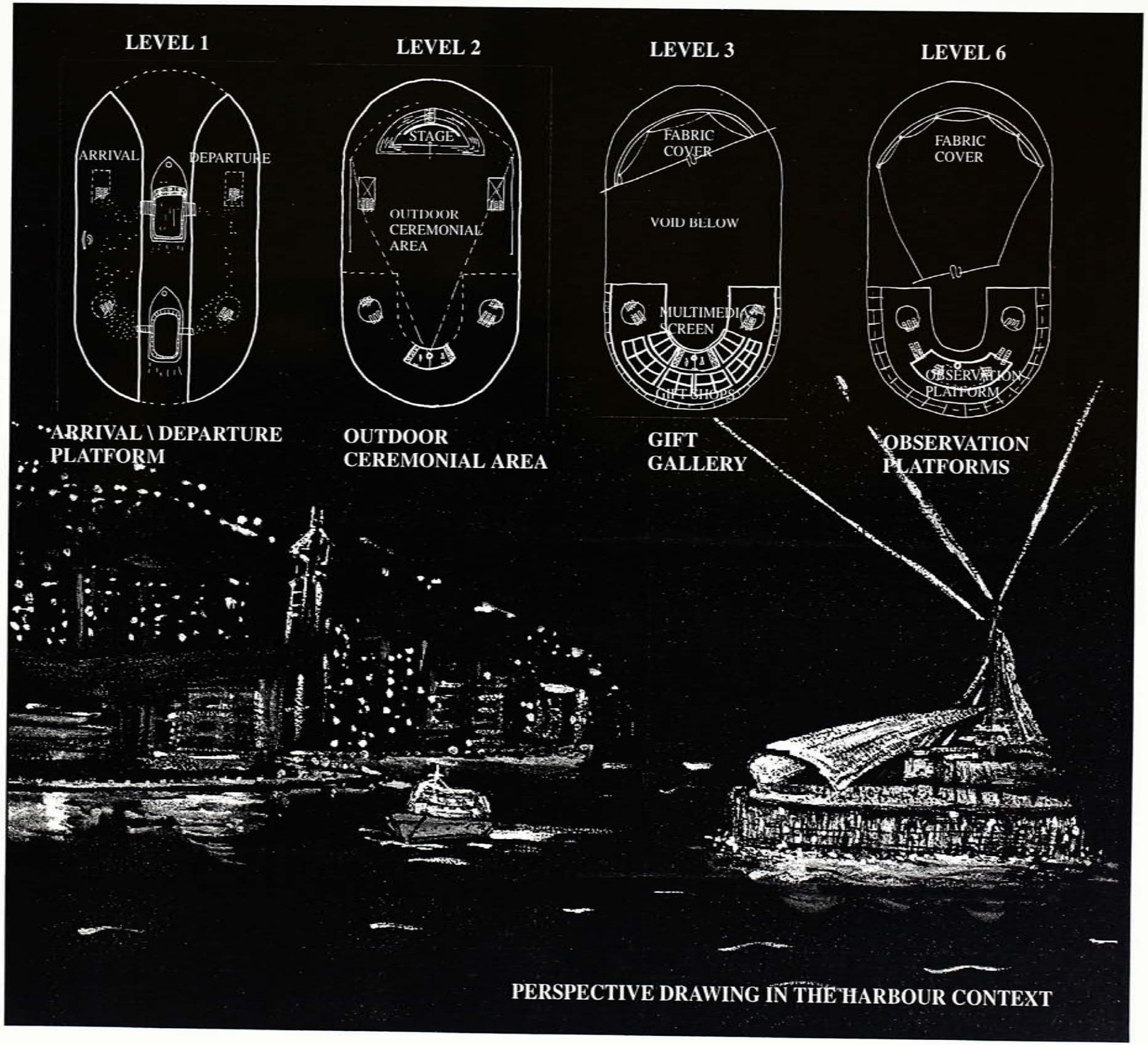
STABILITY OF THE STRUCTURE IS COME FROM THE DUAL HULL AND ANCHOR LEGS

6.14
SECOND PRESENTATION - PLANS AND SKETCHES

22TH NOVEMBER

The organization of the building is divided vertically into four zones. The first zone is level 1, which is the arrival and departure level. The second zone is the level 2, which is the outdoor ceremonial area. There is a fabric roof covering the front part of the area and the back is covered by the upper floors. The third zone is the visitors' building, which includes restaurants, cafes and cultural galleries, comprising the third, fourth and fifth level. The fourth zone is the observation platforms, which is consisted of a several suspended floors.

The external form in the context of the Victoria Harbour is shown in the perspective drawing. The architectural language used is the water and the fabric sail. Water is used as the elevation of the buildings and the fabric sail is used to create a ship image.

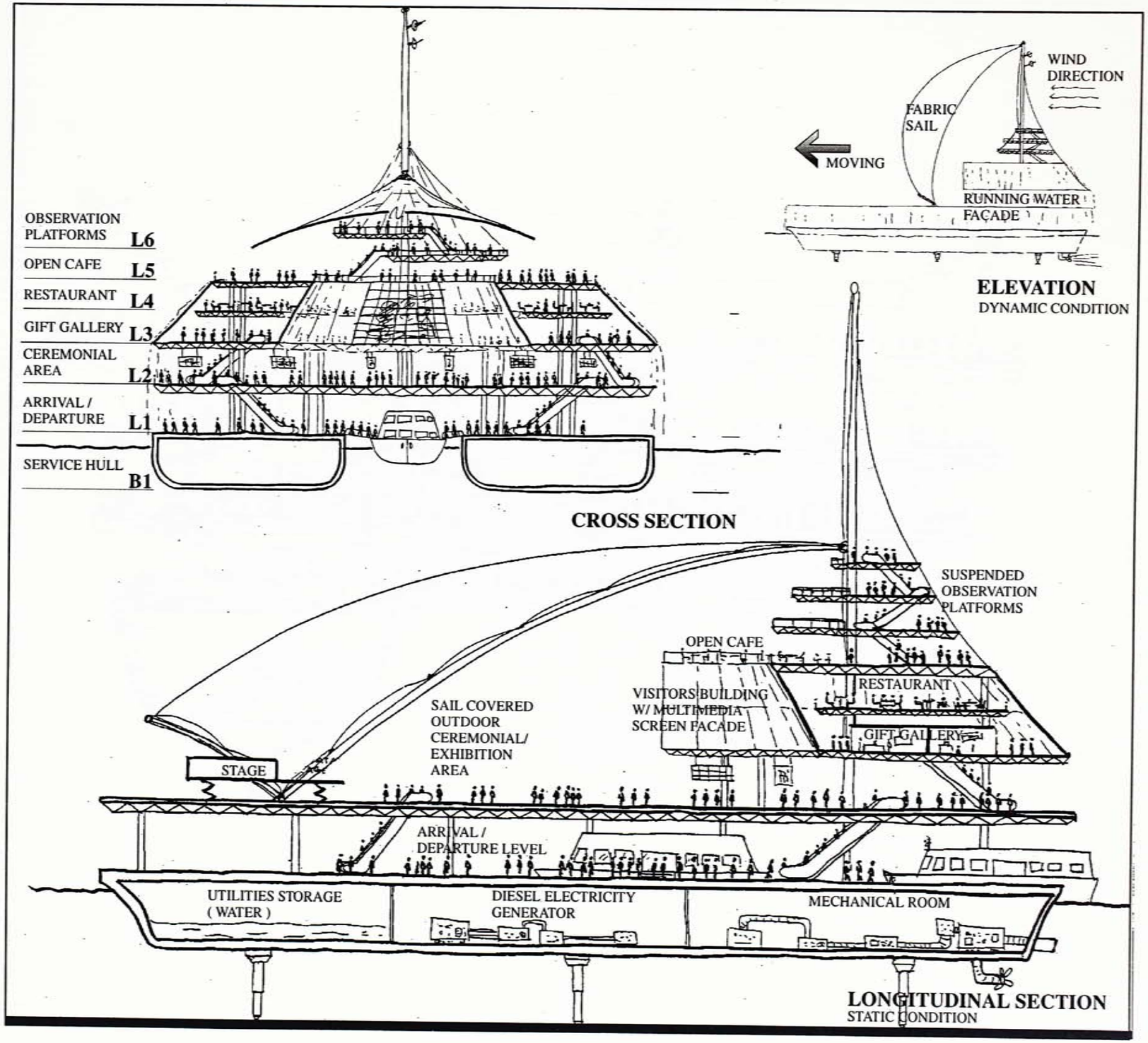


6.15
SECOND PRESENTATION - DRAWINGS

22TH NOVEMBER

The sections shows how the building is organized and the massing. One characteristics of the building is that it has two hulls and they form the departure and arrival platforms of the building. The gap is the port for the boats connecting the shore and the building.

Another characteristics of the building is the fabric cover. It has two functions. When it is in static condition, the roof is in horizontal position so that it forms the roof of the outdoor ceremonial area. On the other hand, when it is in dynamic condition, the fabric is in vertical position so that it captures wind and utilize it to move.



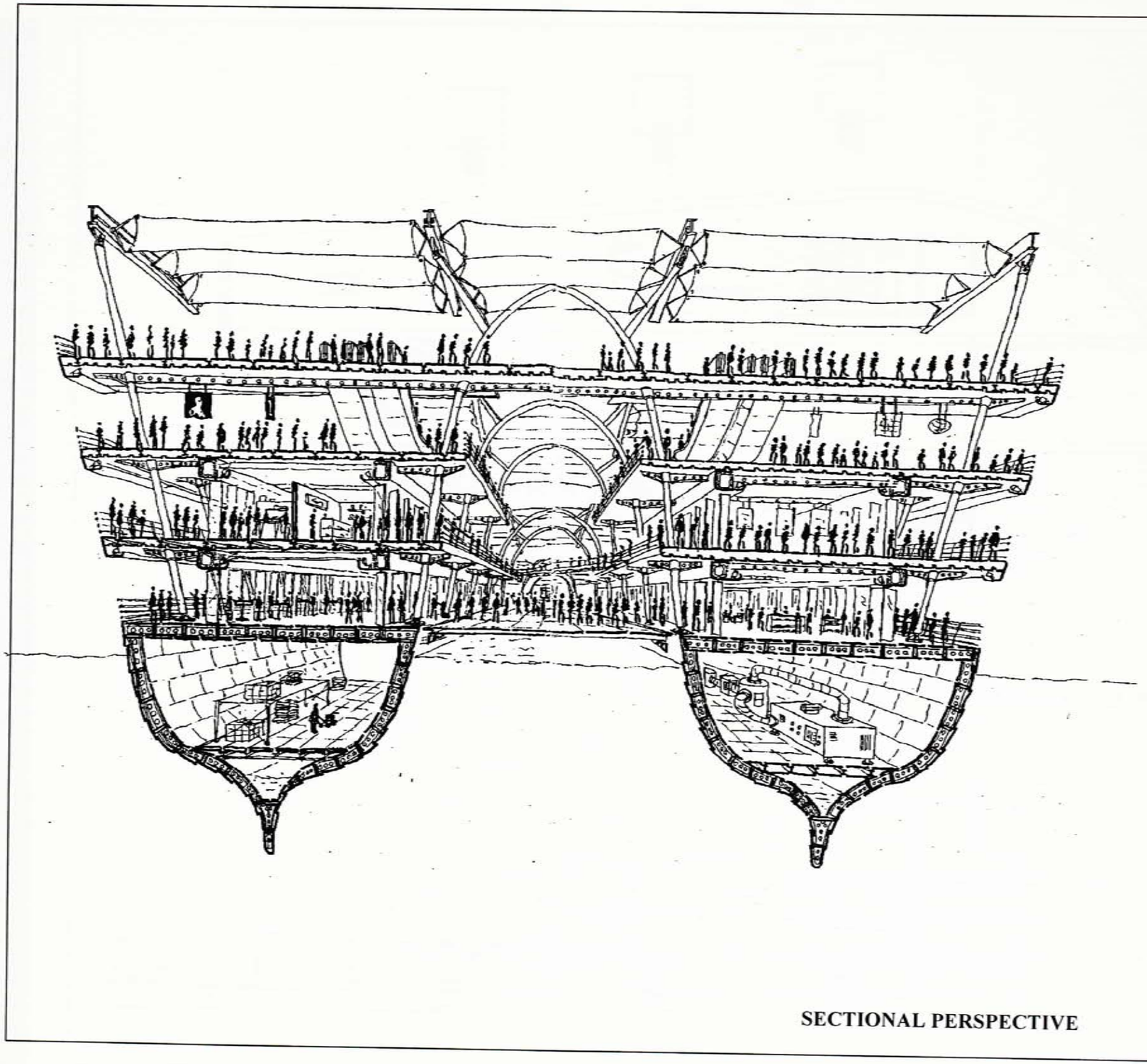
6.16
THIRD PRESENTATION - DRAWINGS

14TH DECEMBER

From the second to the third presentation, the effort is paid to develop the scheme to make everything work. For example, the structural systems, the details of the roof, the construction and framing of the building etc.

Now the roof is changed from a single tensile fabric structure to a serious of fins, acting like shading fins. It reduces wind load and still the roof is able to be see through by rotating the fins to vertical position.

The glazing is changed from conventional vertical glazing to a modular rotatable units of 1m wide x 3m height glass fins. This rotatable fins can be flexible to be opened to encourage natural ventilation at most of time and closed to have mechanical ventilation for extreme conditions.



SECTIONAL PERSPECTIVE

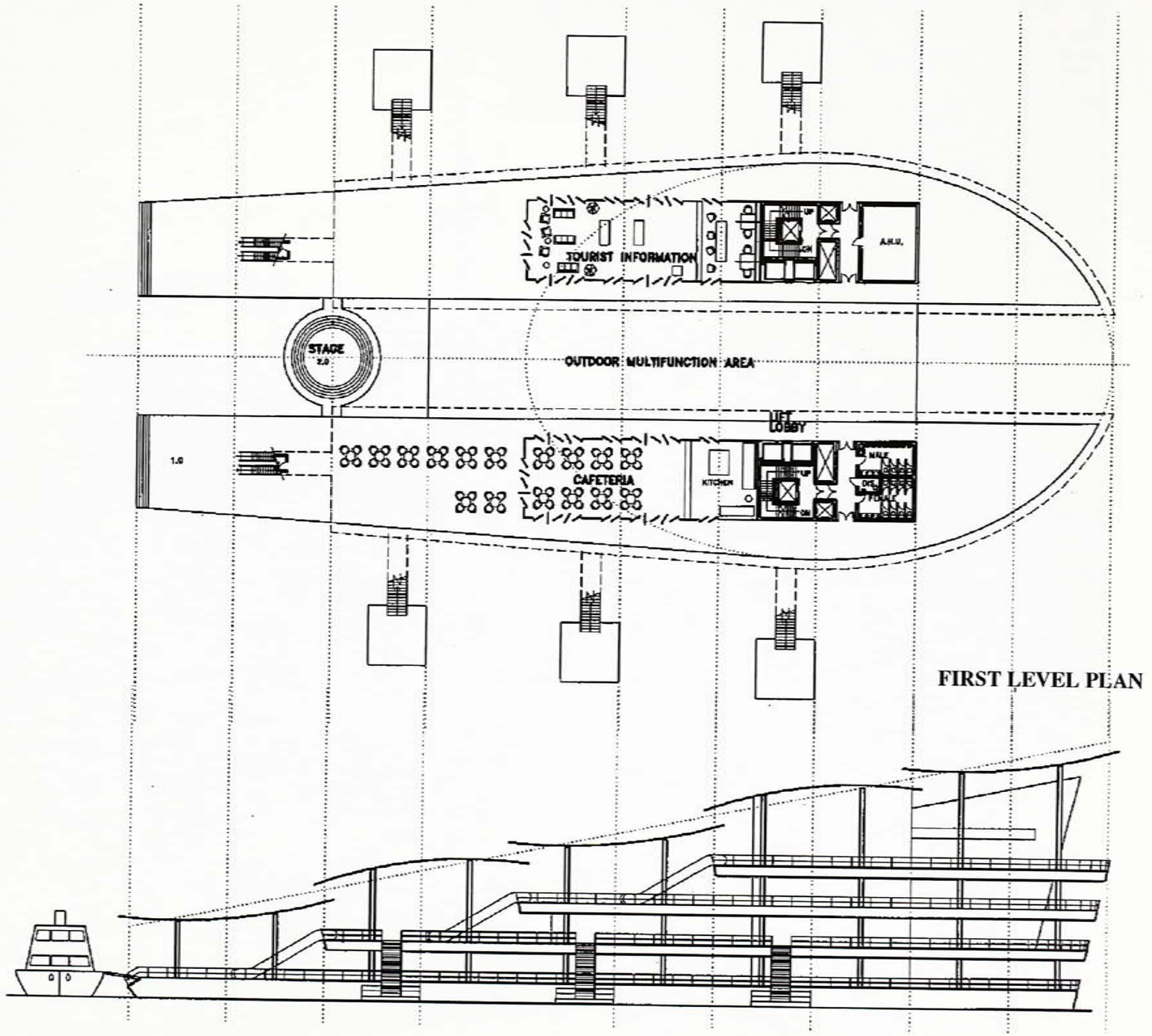
6.17
THIRD PRESENTATION - PLANS AND ELEVATIONS

14TH DECEMBER

From the second to the third presentation, the effort is paid to develop the scheme to make everything work. For example, the structural systems, the details of the roof, the construction and framing of the building etc.

Now the roof is changed from a single tensile fabric structure to a serious of fins, acting like shading fins. It reduces wind load and still the roof is able to be see through by rotating the fins to vertical position.

The glazing is changed from conventional vertical glazing to a modular rotatable units of 1m wide x 3m height glass fins. This rotatable fins can be flexible to be opened to encourage natural ventilation at most of time and closed to have mechanical ventilation for extreme conditions.

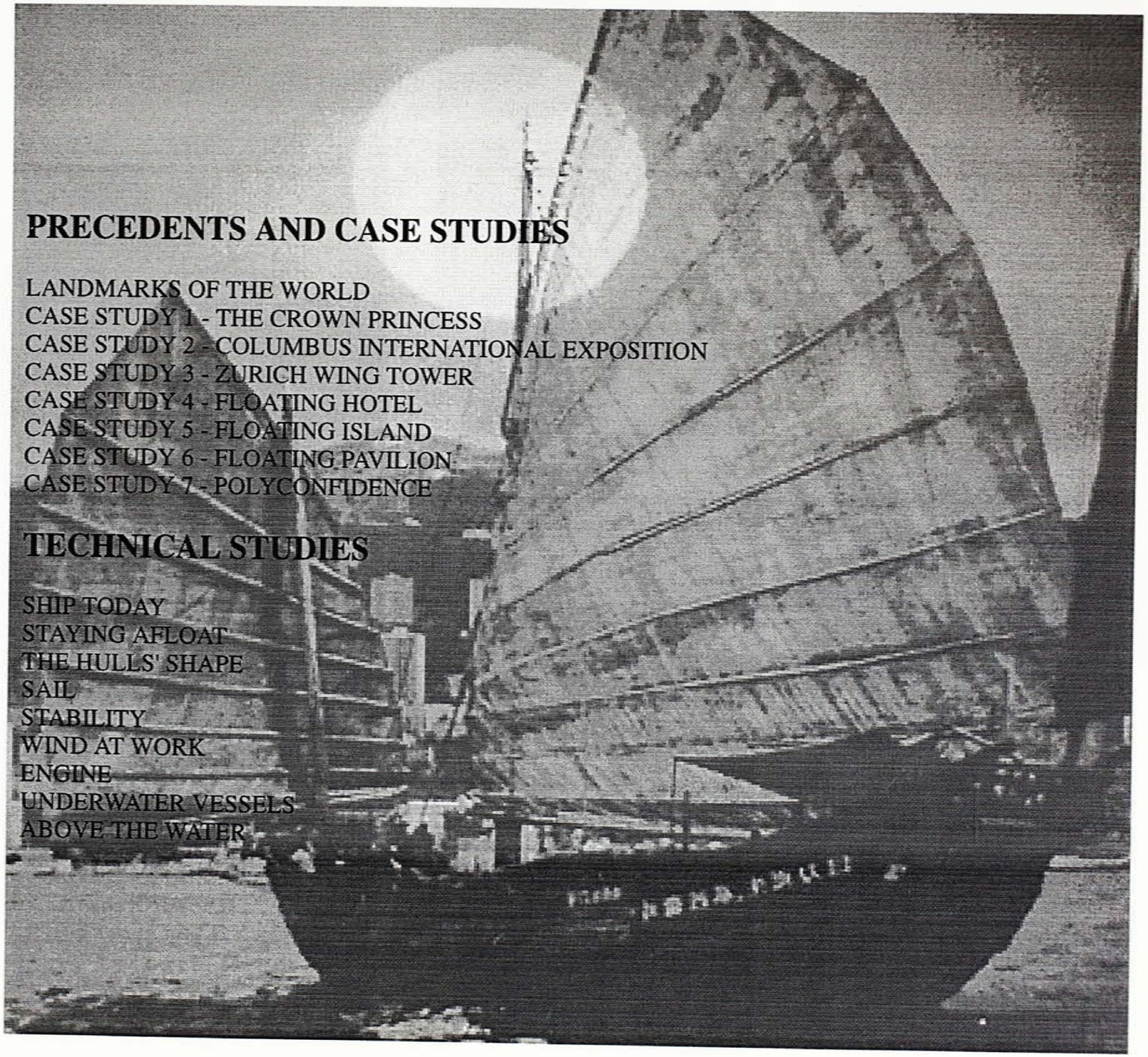


FIRST LEVEL PLAN

SIDE ELEVATION

PART C

APPENDIX



7 PRECEDENTS AND CASE STUDIES

8 TECHNICAL STUDIES

7.1
LANDMARKS OF THE WORLD

PARIS
THE EIFFEL TOWER

NEW YORK
LIBERTY STATUE

BEIJING
CHINESE HERO MONUMENT

EGYPT
THE PYRAMID

LONDON
THE BIG BEN GATE

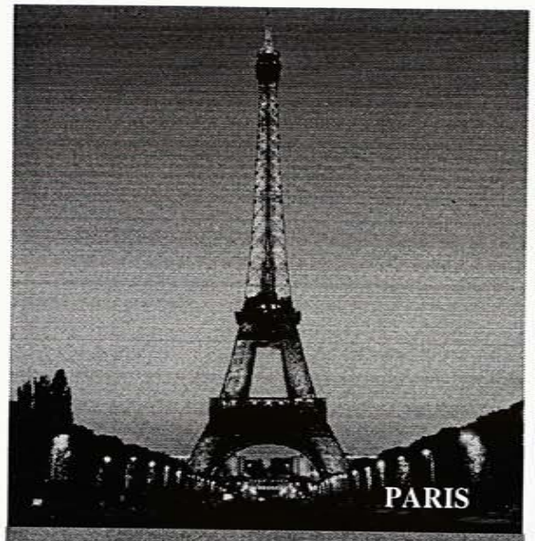
JAPAN
THE TORII

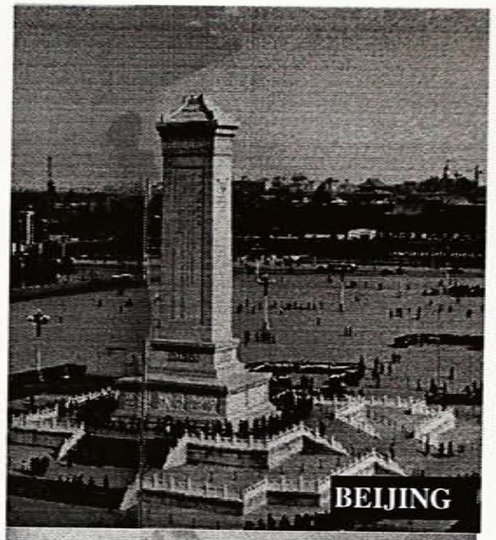
ROME
THE COLOSSEUM

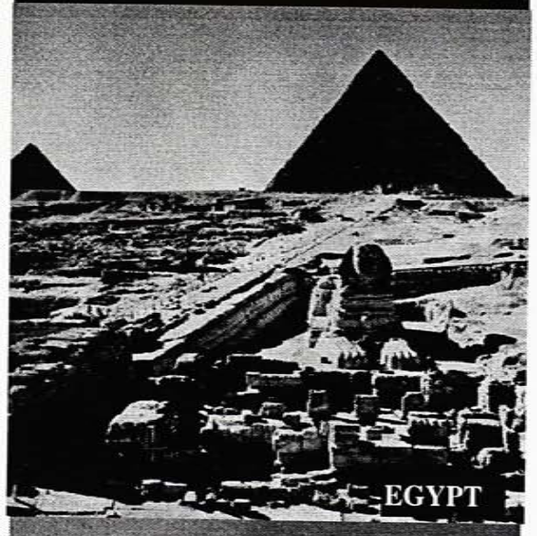
WASHINGTON D.C.
WASHINGTON MONUMENT

FLORENCE
THE DUOMO

PHOTO CREDITS
Charles Moore, Water + Architecture, Thames and Hudson, 1988 (5,6,8)
Cities of the World - Egypt (4)
Cities of the World - Beijing (3)







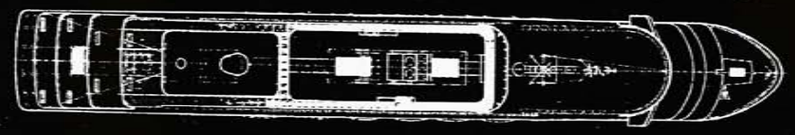
7.2
CASE STUDY 1

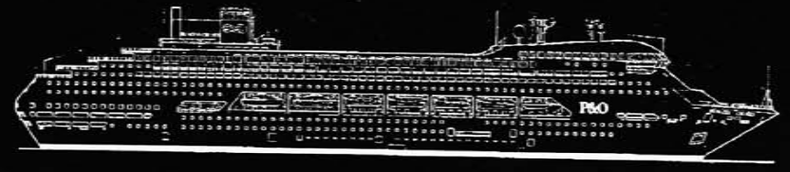
The Crown Princess --
a cruise ship
designed by
Renzo Piano Building Workshop
in year
1984 - 1990 in Genoa

The ship is 246 metres in length, 32 metres in beam and 53 metres from the keel to the roof of the observation lounge. It weights 70,000 tons having a draught (the depth of the ship beneath the water line) of 7.8 metres. Thirteen decks provide a total floor area of 50,000 square metres accommodating 1,750 passengers in 798 cabins. There is a crew of 656 and the ship can travel at 22 knots.

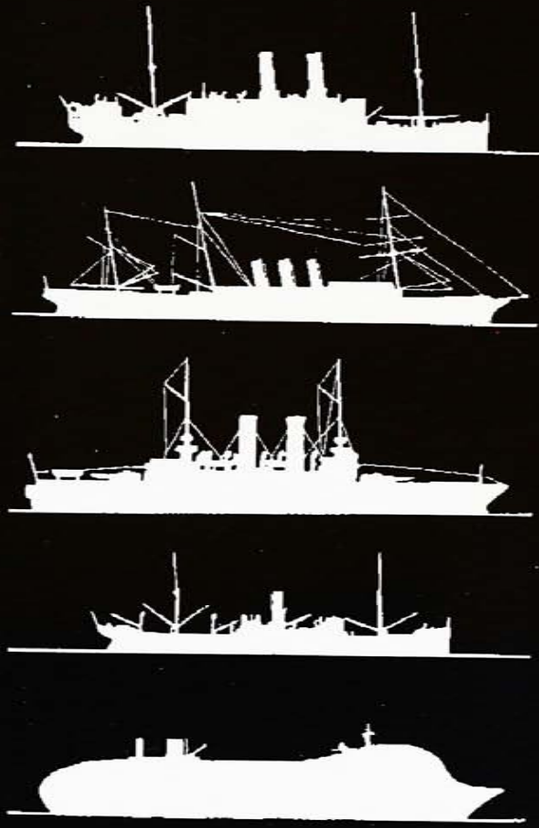
There are 6 sequences in construction:
Sequence 1: Hull under construction
Sequence 2: Decks being laid floor to floor Sequence 3: Aluminum shell being lifted in position by crane
Sequence 4: External scaffolding and service ducts laid
Sequence 5: Interior decorations starts
Sequence 6: Completed ship leave the shipyard

PHOTO CREDITS
Peter Buchman, Renzo Piano Building Workshop Vol.2, Phaidon

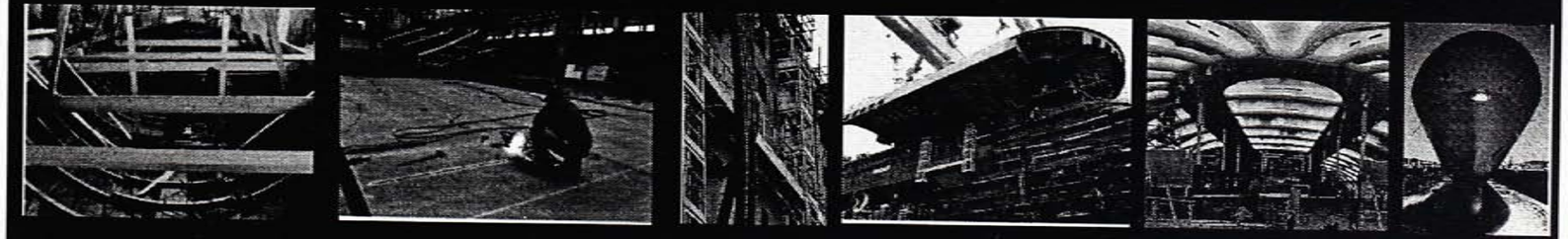




PLAN AND SECTION



SILHOUETTE STUDY



CONSTRUCTION SEQUENCE

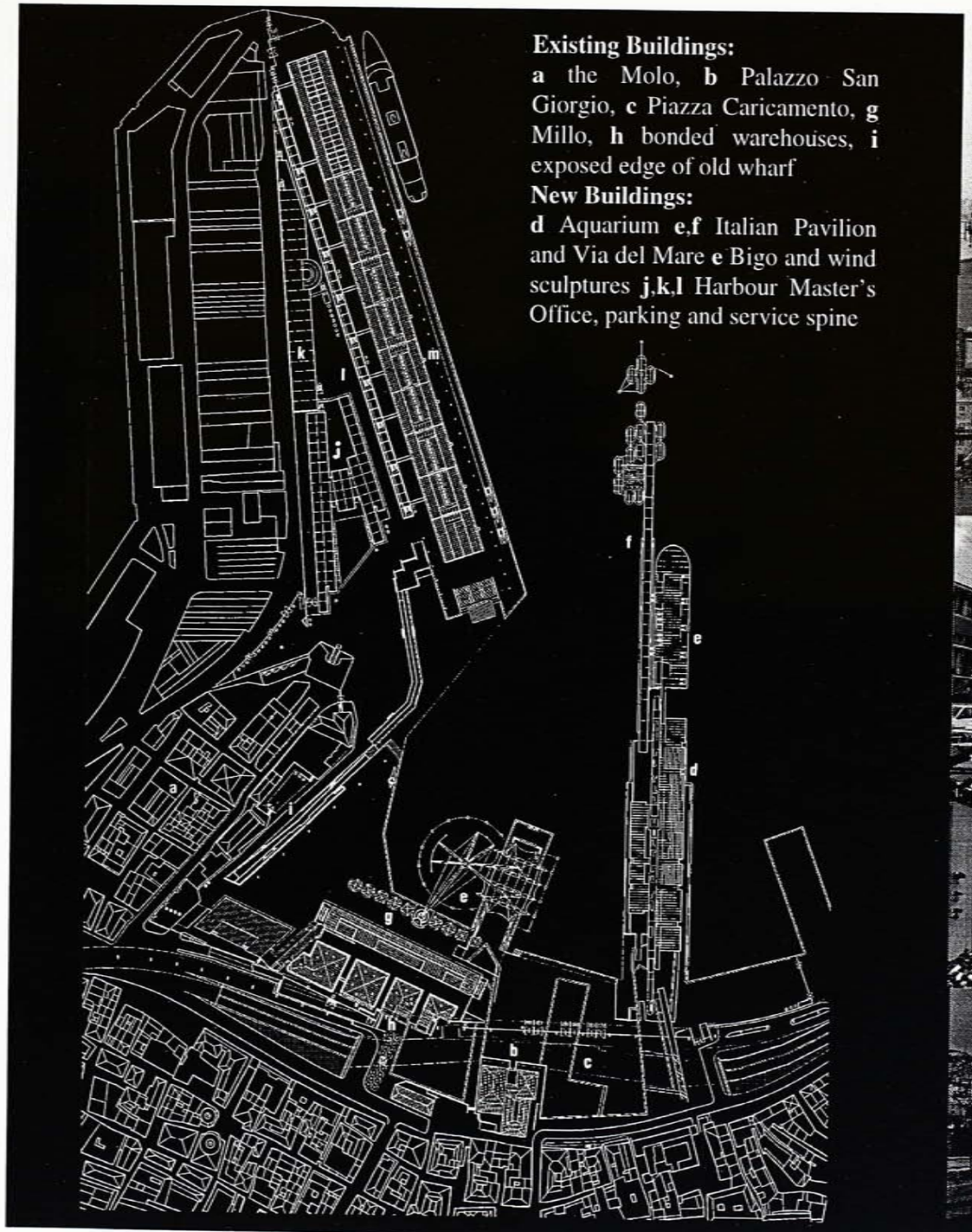
7.3
CASE STUDY 2

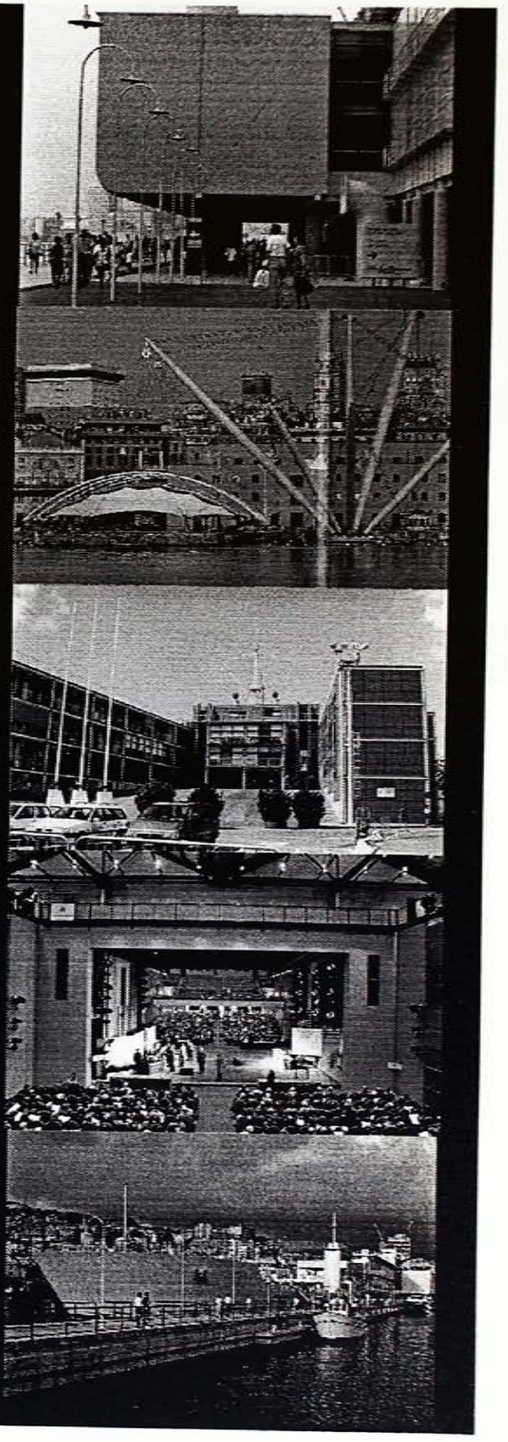
Columbus International Exposition
built in
Porto di Genoa, Italy
designed by
Renzo Piano Building Workshop
in year
1984 - 1992

The Exposition is a short-term event, celebrating the 500th anniversary of the first voyage to America. A central aim of the design is to reconnect city and sea. Therefore, the image of the new buildings should reflect this theme. This is to be achieved using the image of crane arms in the ships to create an view-arresting structure and symbol of the whole complex. Also, as a reflection of the historic and nautical themes of the exposition, great emphasis was also placed on restoring some of the fine historical dockside buildings and exposing and conserving other traces of the past.

The plan on the right shows the master plan of the Exposition. The new extrusion are the new buildings of the Exposition where the buildings around the Harbour are restoration projects:

PHOTO CREDITS
Peter Buchman, Renzo Piano Building Workshop Vol.2, Phaidon





7.4
CASE STUDY 2A

Bigo and Wind Sculptures

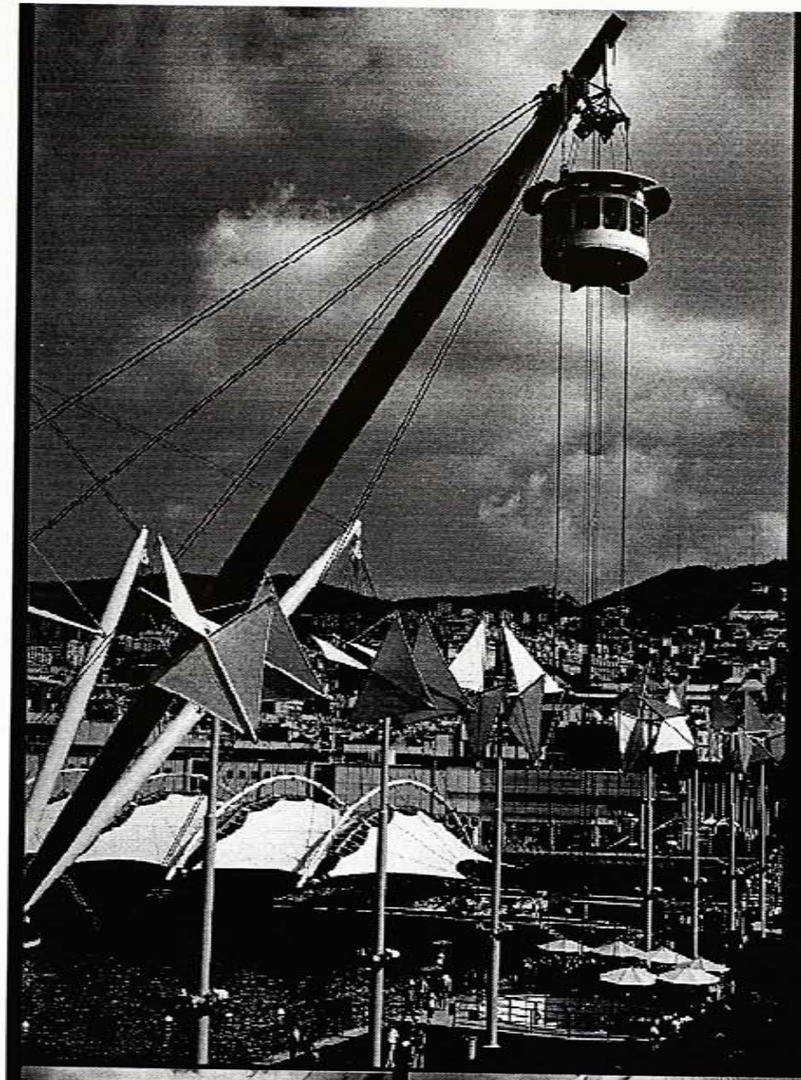
built in

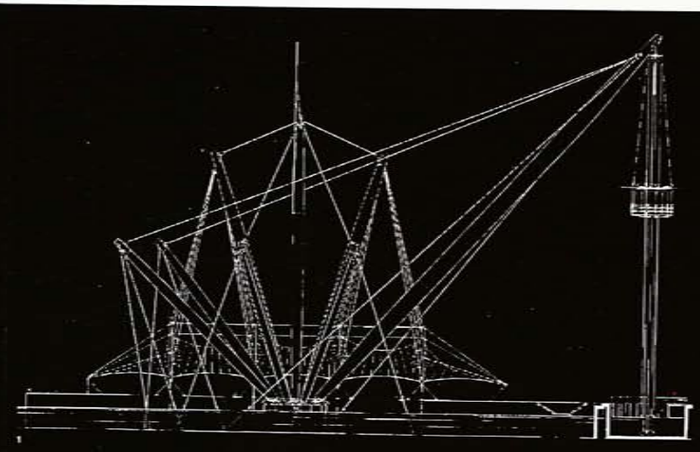
near **Palazzo San Giorgio**

The most visually arresting of the new structure, both in location and exuberant design, is the Bigo, being the symbol of the Exposition. This is the heart of the Exposition because the opening ceremonies are held there.

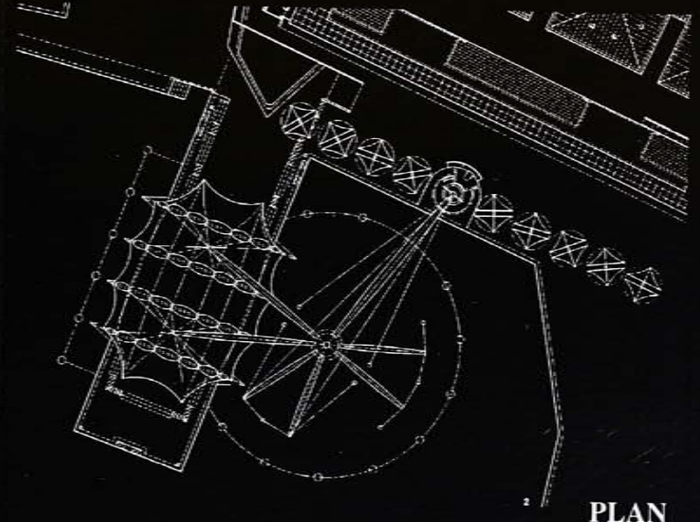
The location of the Bigo is at the centre of the Exposition site and it is so distinctive that everybody come here must remember it. This Bigo, have a symbolic meaning of a gigantic derrick, which Piano is inspired by the cranes on the ships. But except the symbolic functions, it is also the structure of the tent roof of the performance area as well as the panoramic lift cabin. Just behind the Bigo along the edge of the water are a series of multi-sailed wind sculptures.

PHOTO CREDITS
Peter Buchman, Renzo Piano Building Workshop Vol.2, Phaidon

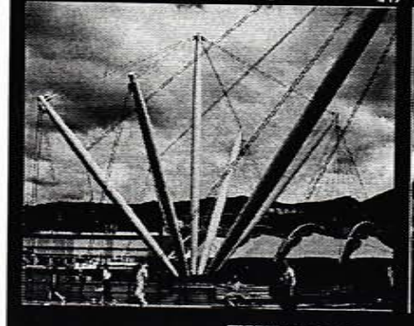




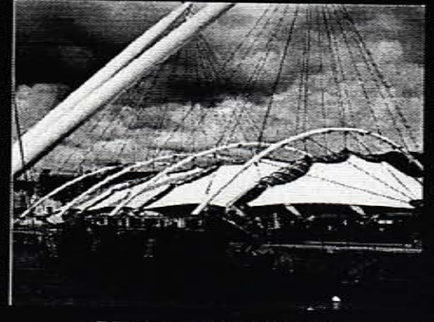
ELEVATION



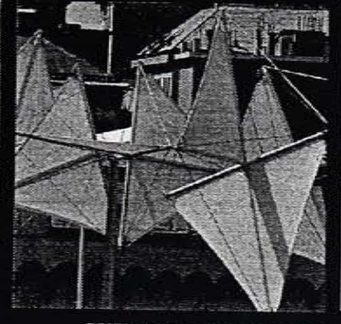
PLAN



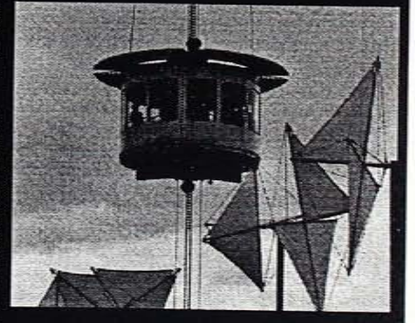
THE BIGO



PERFORMANCE AREA



WIND SCULPTURE



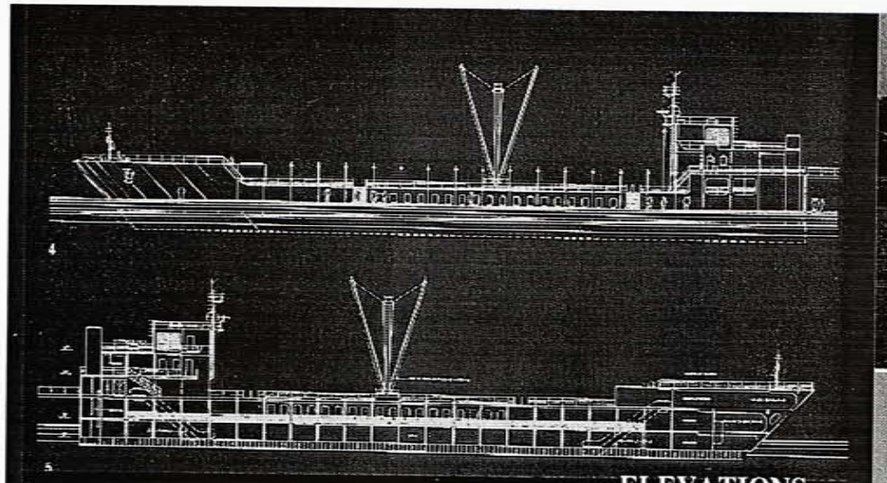
LIFT CABIN

7.5
CASE STUDY 2B

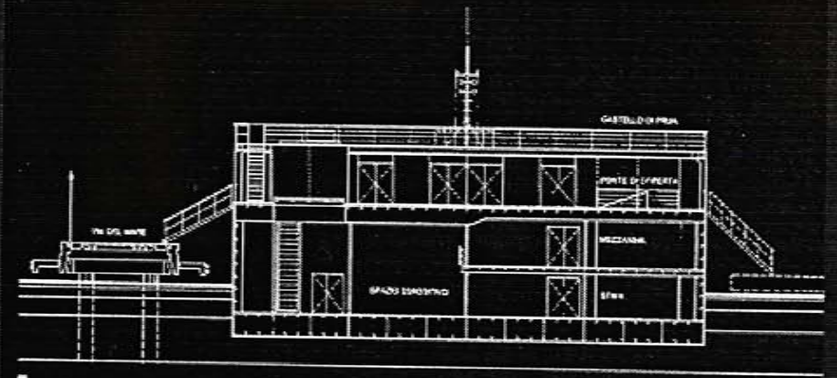
Italian Pavilion --
at **Via del Mare**

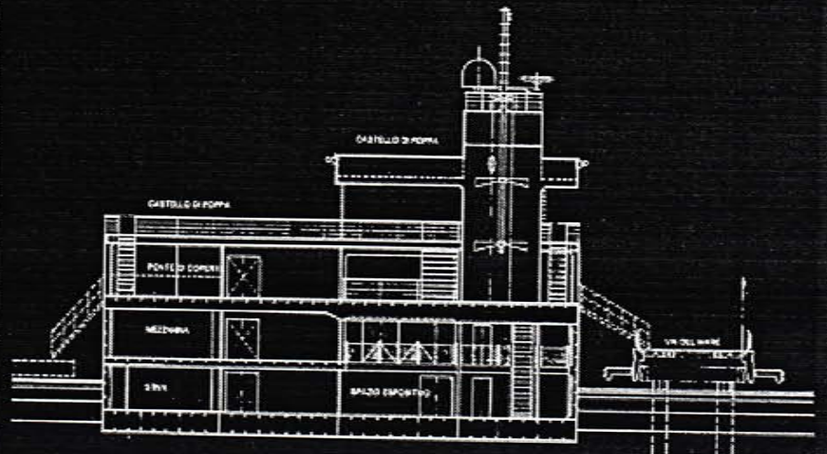
From the aquarium exit going beyond the Via del Mare, the route proceeded to the bare deck of the floating Italian Pavilion. This is in fact a ship to serve as a generation of publicity to various parts of the world prior to the opening of the Exposition. This Pavilion consists of Exhibitions of marvelous historic models of ships, real figureheads and hundreds of samples from an enormous contemporary collections of models, all to the same scale. of ships of every type throughout history. Also, there are a number of Perspex globes and video monitors explained aspects of the earth's climate and ocean currents.
The symmetrical ship-like hull wit the asymmetrical superstructure make it a strange object floating on the Harbour. This kind of the conflict reflects Piano's ambivalence to whether assemble the pavilion with a real ship. In fact, the symmetrical hull is designed so that it can be traveled at the sea well. The asymmetrical form, on the contrary, is to make it not so like a ship at all.

PHOTO CREDITS
Peter Buchman, Renzo Piano Building Workshop Vol.2, Phaidon

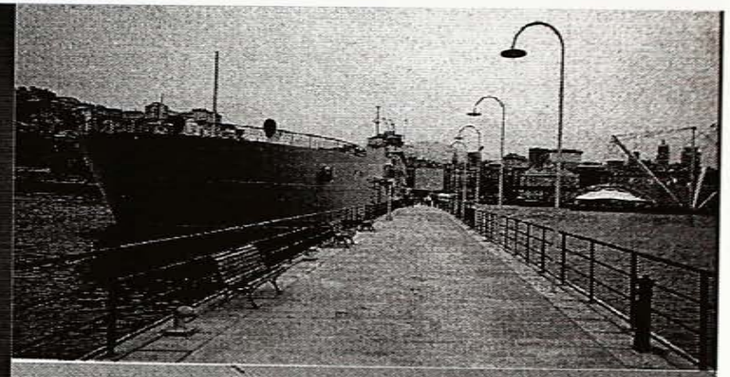


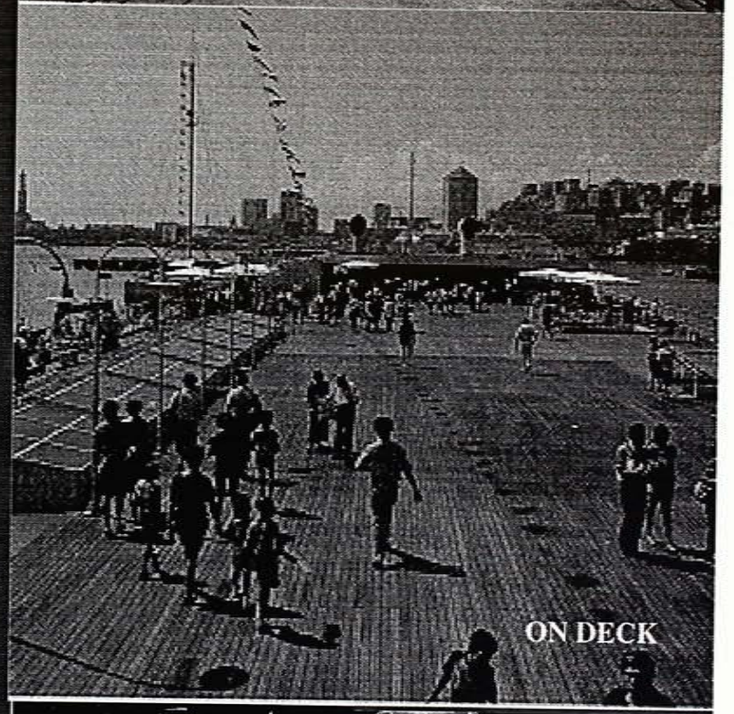
ELEVATIONS



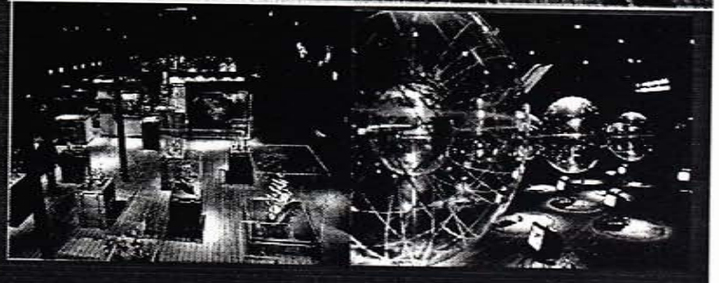


SECTIONS





ON DECK



EXHIBITION HALL INTERIORS

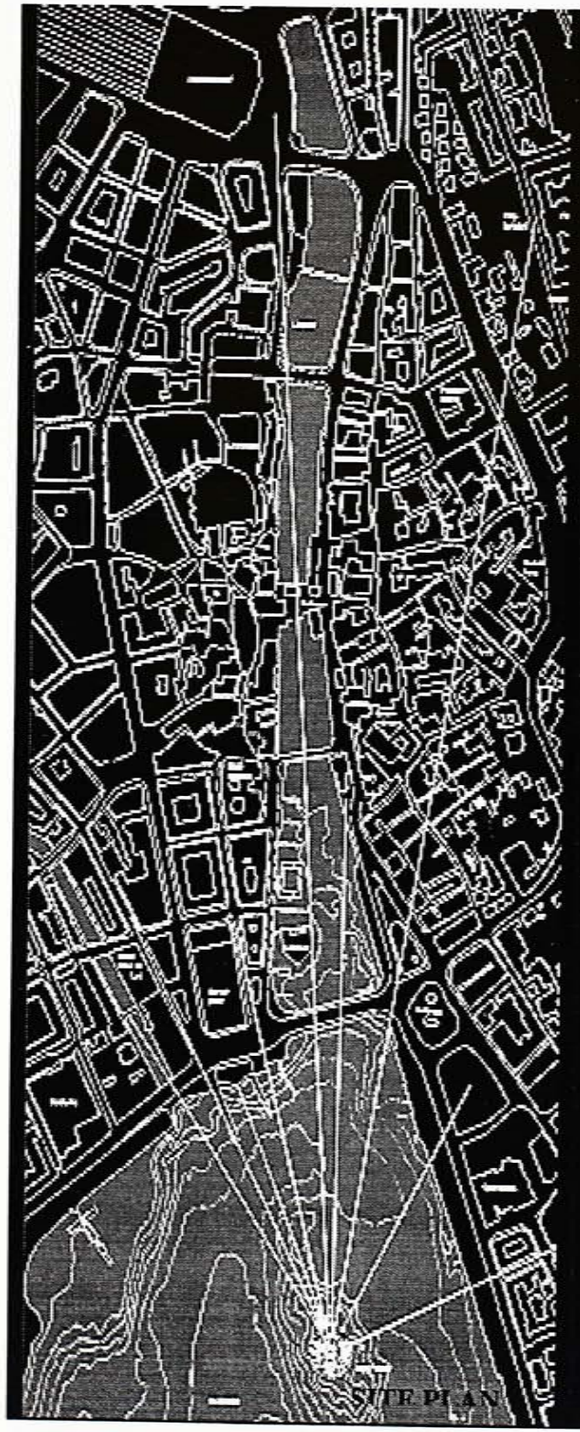
7.6
CASE STUDY 3

Zurich Wing Tower
built in
Lake Zurich, Switzerland
designed by
Richard Horden

The project is to design a 100m tower that would express the city's great technological capabilities, past and future. The base of the tower should form an arena, a new social event space in the square for exhibition, concerts and promotions, and the strong visual feature at the centre of the city. Adjoining the arena is a reception for the top, a foot court and information centre. The top of the tower includes a radar, satellite dishes, weather antennae and electronic information systems.

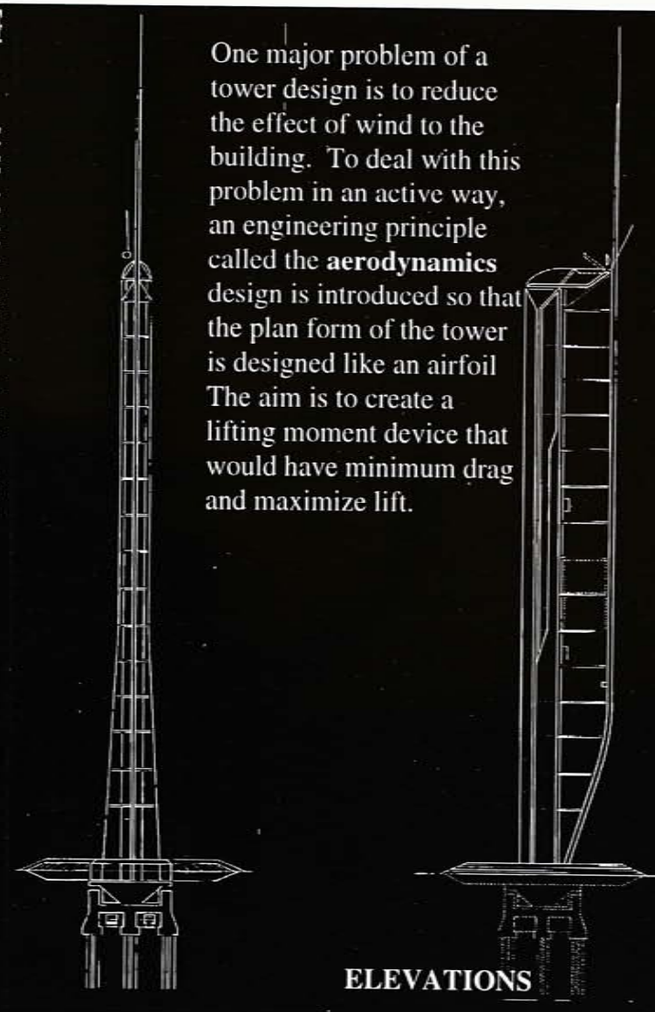
The "wing" is an expression of a desire to live and design in harmony with the natural force of wind and gravity. Therefore, the tower is designed to that as wind shifts, the tower rotates to windward. This can reduce the surface area of the wing into wind and enables a lighter construction.

PHOTO CREDITS
Werner Blaser, Light Tech,
Birkhauser, 1995

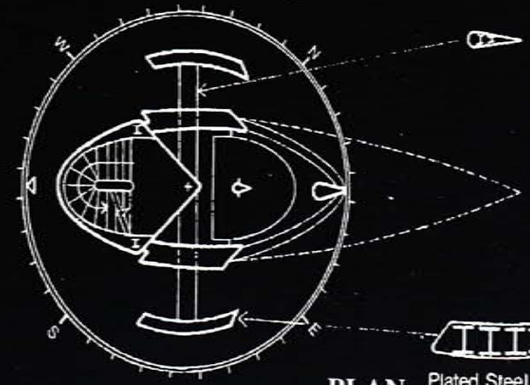


SITE PLAN

One major problem of a tower design is to reduce the effect of wind to the building. To deal with this problem in an active way, an engineering principle called the **aerodynamics** design is introduced so that the plan form of the tower is designed like an airfoil The aim is to create a lifting moment device that would have minimum drag and maximize lift.

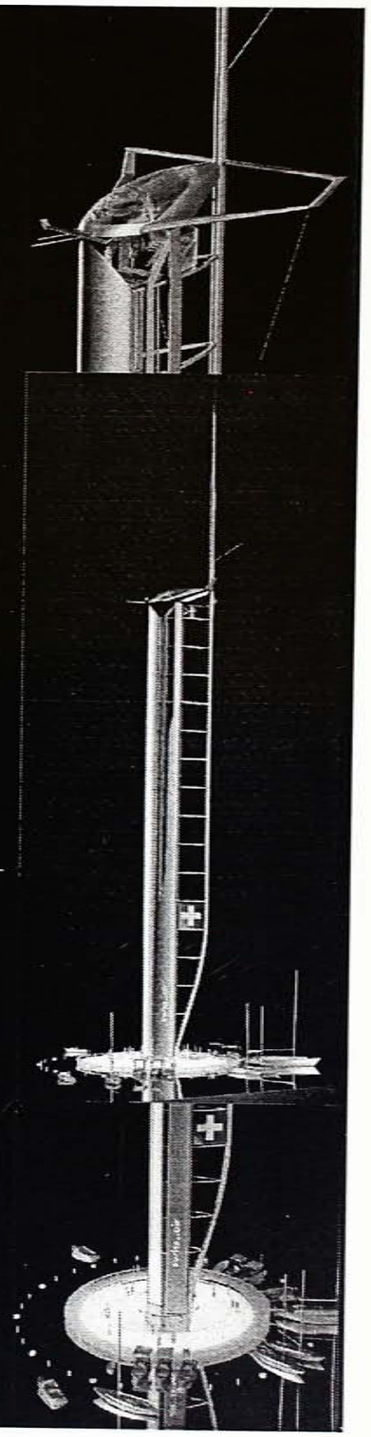


ELEVATIONS



PLAN

Plated Steel Assembly



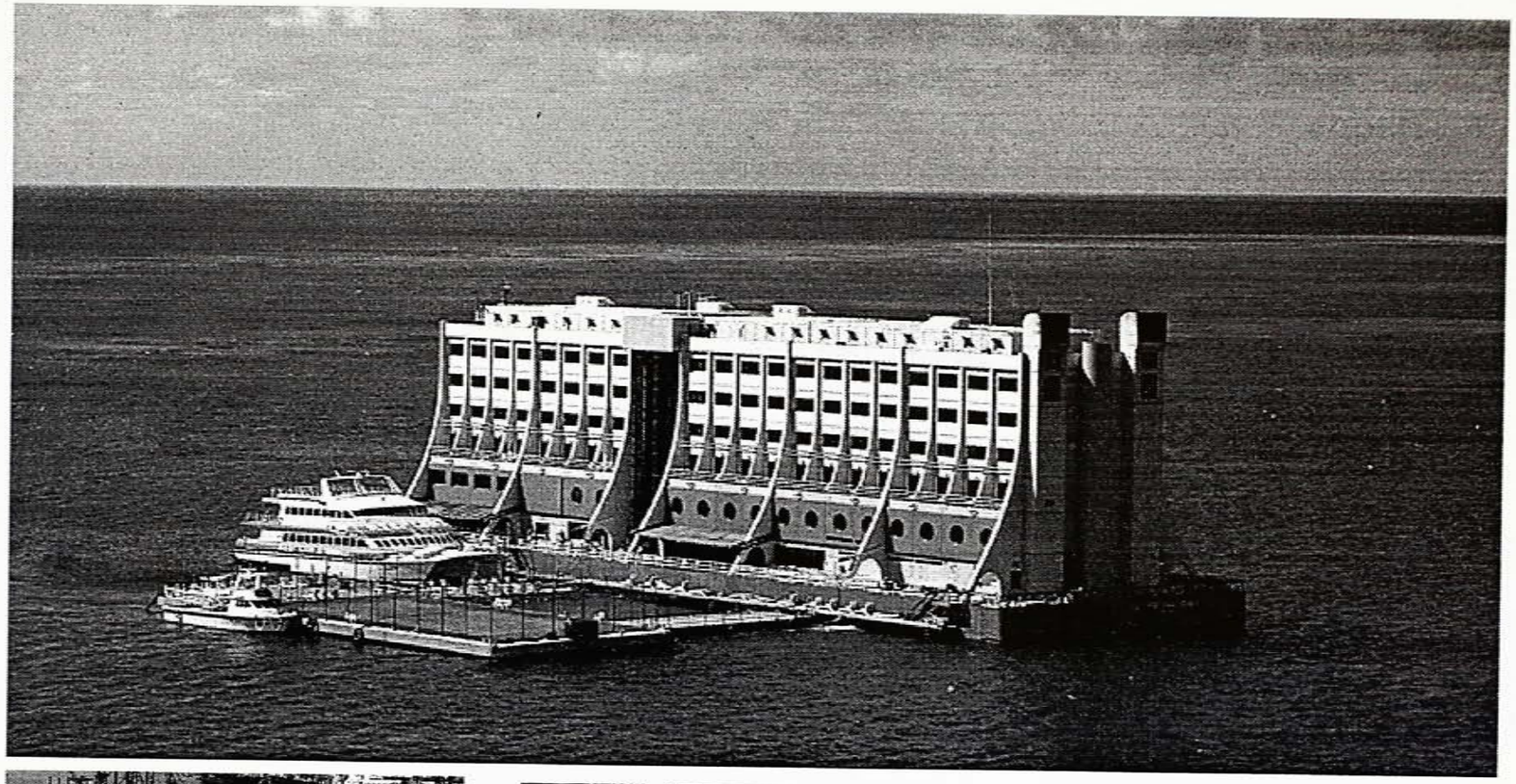
7.7
CASE STUDY 4

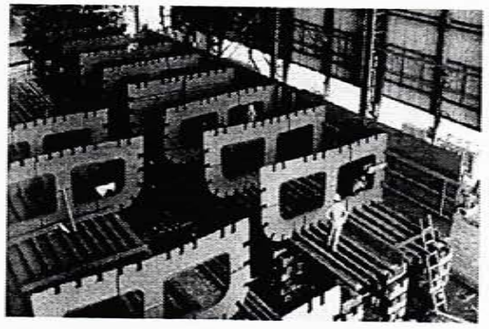
Floating Hotel
built in
Great Brewer Reef, Queensland
designed by
Consafe Engineering, Ltd

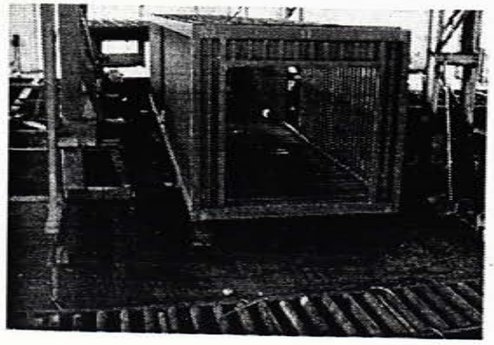
The Great Barrier Reef is one of the major wonders of the world. This hotel is constructed to accommodate the tourists and the visitors to view the reef. The Hotel consists of a 89.2 x 26.6 x 6 metre steel barge, supporting a main and first deck of the purpose-built superstructure which, in turn, supports five additional decks. Accommodation comprises 200 rooms with en-suite bathrooms and air-conditioning. The hotel has been fitted out to luxury standards and provides for large internal open spaces.

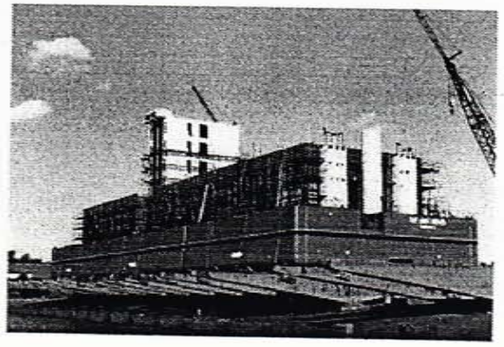
The construction started in Singapore in 1986. Transshipment to Australia was undertaken by the heavy lift carrier "mighty Servant 2". This involved the carrier submerging so that the hotel could be positioned above its deck. Final fitout of the hotel continued during the voyage and after arrival in Australian waters in 1987. The hotel opened for business in March 1988.

PHOTO CREDITS
Akio Kuroyangi, Process:
Architecture, no.96









7.8
CASE STUDY 4A

FLOATING HOTEL TECHNOLOGIES

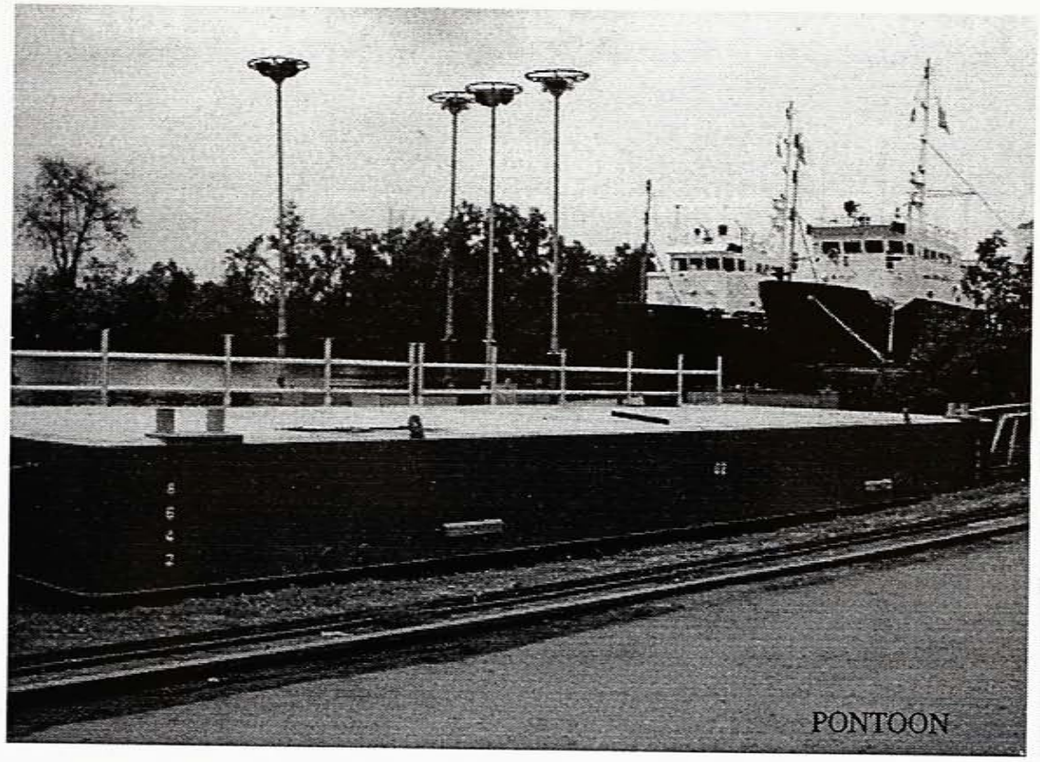
MOORING SYSTEM

The main mooring system consisted of six 89mm stud link chain legs each approximately 250 metres in length attached to 18.4 ton Stevshark anchors. The chain ends were attached to a 110 ton counterweight which was suspended, via a swivel, from a mooring arm mounted on the bow of the hotel. This form of single point mooring system is common with deep sea oil rigs and other off shore fixed moorings.

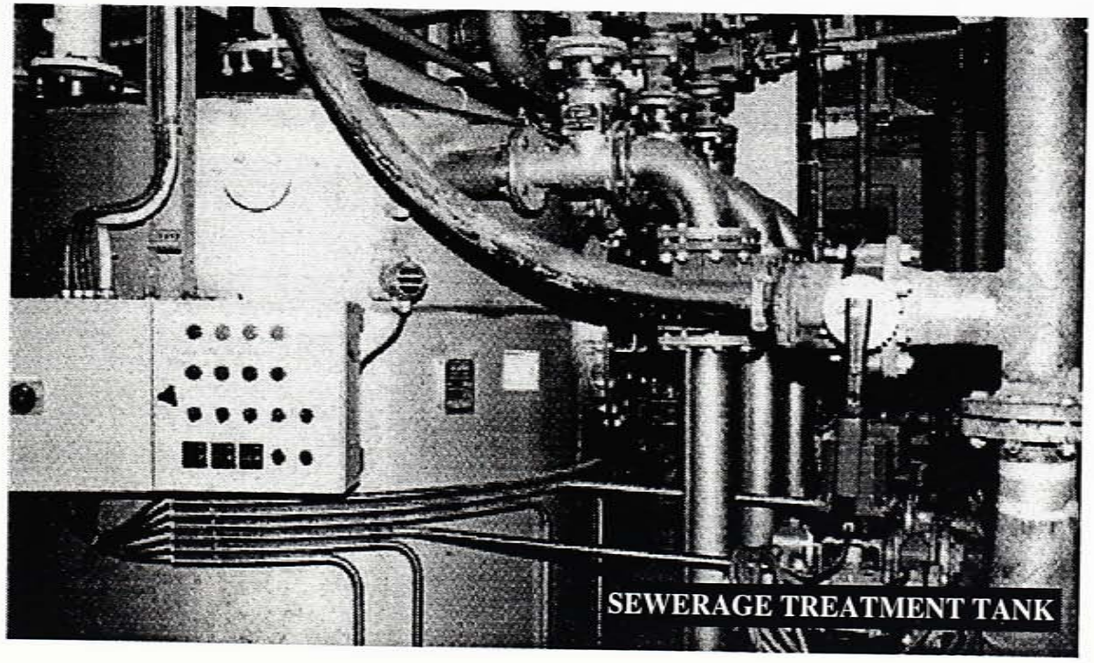
SEWAGE SYSTEM

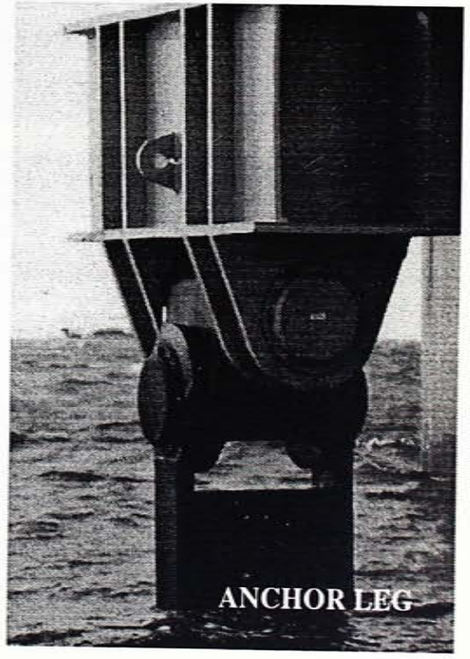
All sewage is treated onboard (tertiary treatment) and the liquid (treated water) is pumped to a storage tanks onboard. All solid sewage is pumped to a sludge tank and thereafter injected into a high temperature incinerator onboard and burnt and the ashes are taken ashore for disposal. The treated water is loaded into a supply barge on a regular weekly basis and released into open water at least 5km from the Reef.

PHOTO CREDITS
Akio Kuroyangi, Process: Architecture, no.96


PONTOON


COUNTERWEIGHT


SEWERAGE TREATMENT TANK


ANCHOR LEG

7.9
CASE STUDY 5

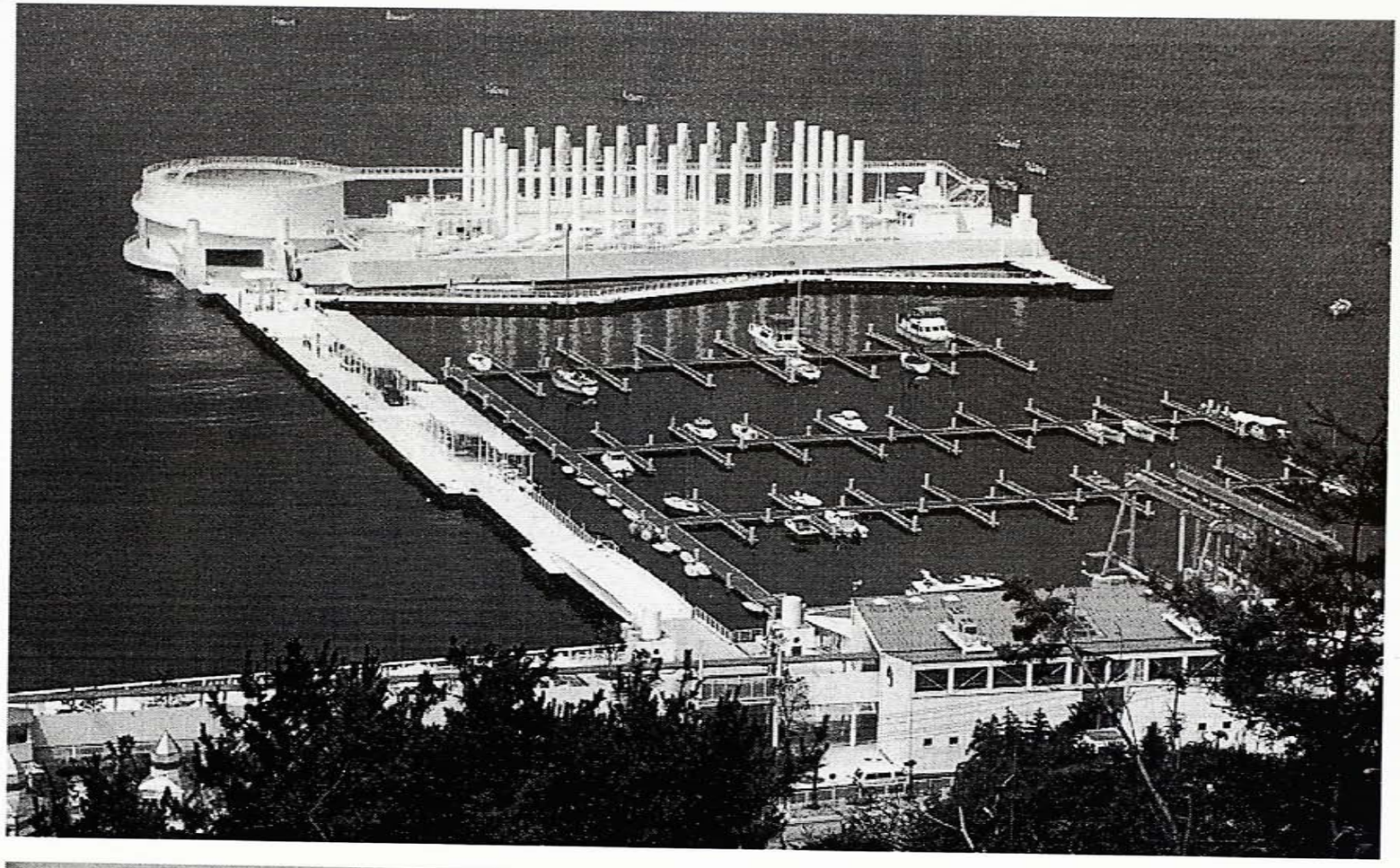
Floating Island
built in
Onomichi City, Japan
designed by
Eiichi Yanagita, Tsuneishi Shipbuilding Co., Ltd

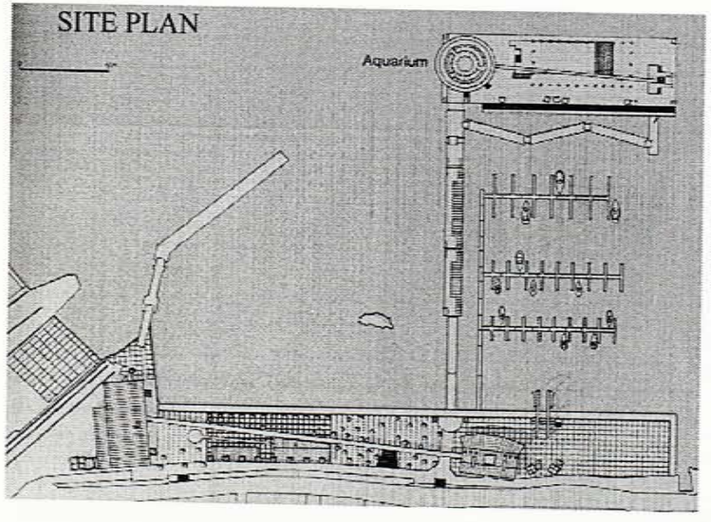
It is a marine park floating on the sea. It contains a large aquarium, a small theater, and a gallery. The deck houses an outdoor theater with 300 seats, a swimming pool, an open plaza. It also has a fisherman's wharf and restaurants, both large and small.

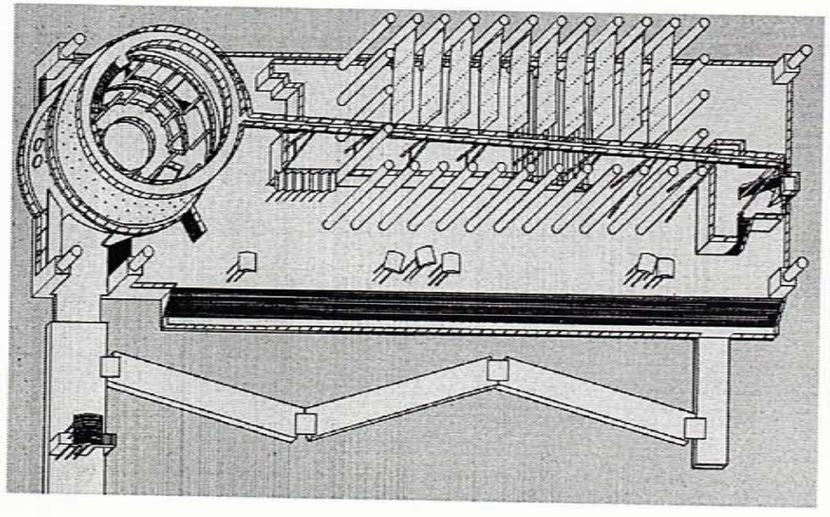
Above all, the floating island is vested with some important functions - for example, its wave-dissipating structure acts as a break water, creating calm in the waters of the yacht Harbour. That the parent management company is a shipbuilding concern without doubt helped bring this idea into existence. One great asset of the design is the space inside the hull can be fully used.

The floating structure is an image which blends in magnificently with nature. It serve to present a theatrical, abstract, and rather unusual image to visitors.

PHOTO CREDITS
Akio Kuroyangi, Process: Architecture, no.96







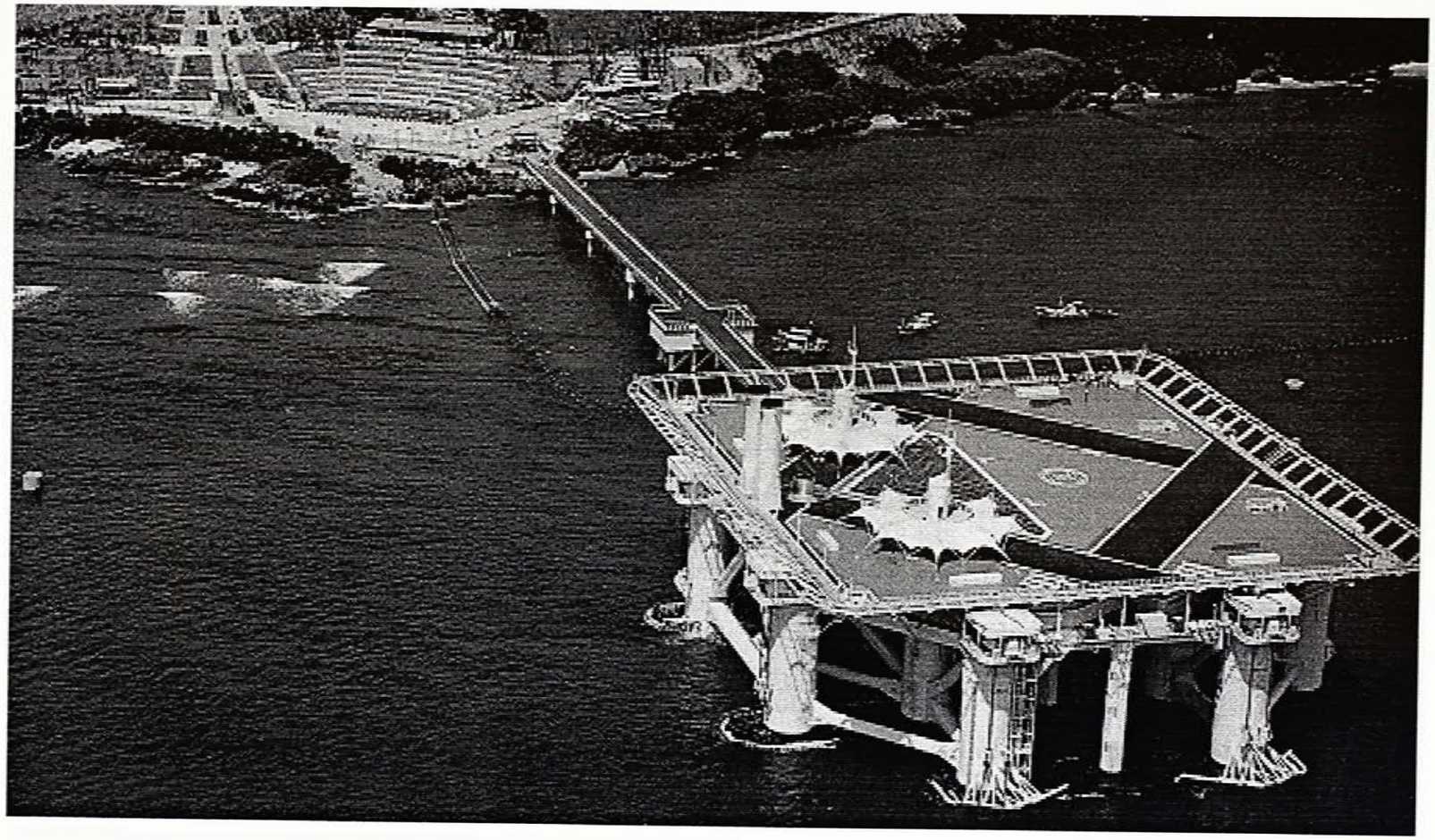
7.10
CASE STUDY 6

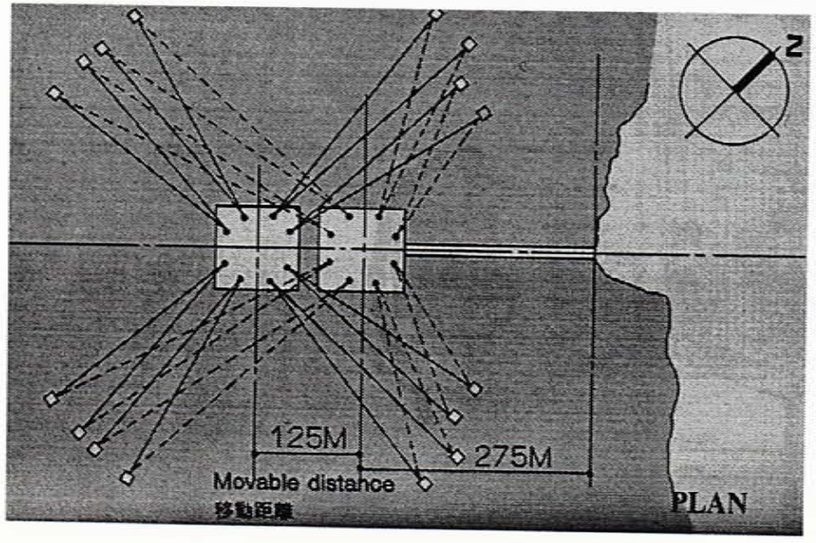
Floating Pavilion - Aquapolis
built in
Okinawa, Japan
designed by
Kibutake Architect & Asso.

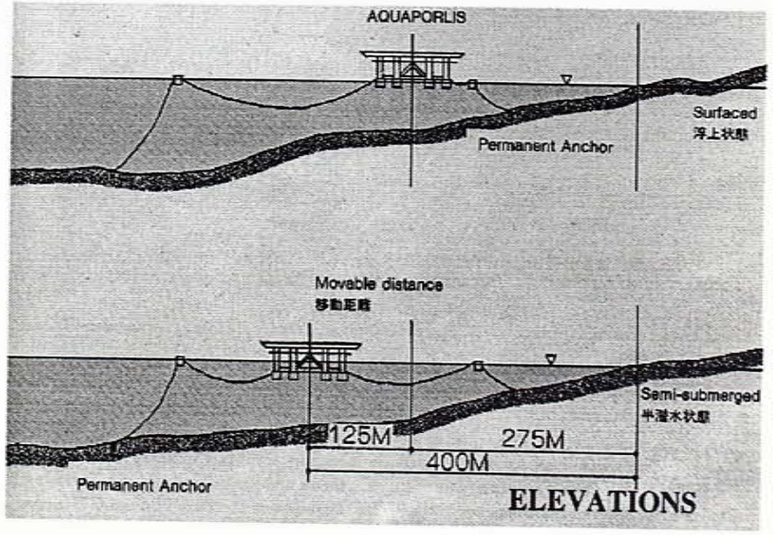
Aquapolis is a model of marine city. It was constructed as a government pavilion at the Okinawa International Ocean Exposition held in 1975. The building formed the symbol of the exposition during its half year run, and was visited be two-third of the visitors.

The building is floating on the sea. 16 columns on four horizontal buoyant foundations support the superstructure. Fur lower hulls submerges into water. Buoyancy can be adjusted by pumping water into or out of the lower hulls and columns, thus allowing them to surface, half-submerge, or submerge to adjust the position of the center of gravity. Furthermore, Aquapolis can be moved horizontally by up to 200 metres by winding on chains anchored on the seabed. This enables the structure to weather severe conditions, including typhoons. A closed system achieves energy-saving without polluting the surrounding environment.

PHOTO CREDITS
Akio Kuroyangi, Process:
Architecture, no.96







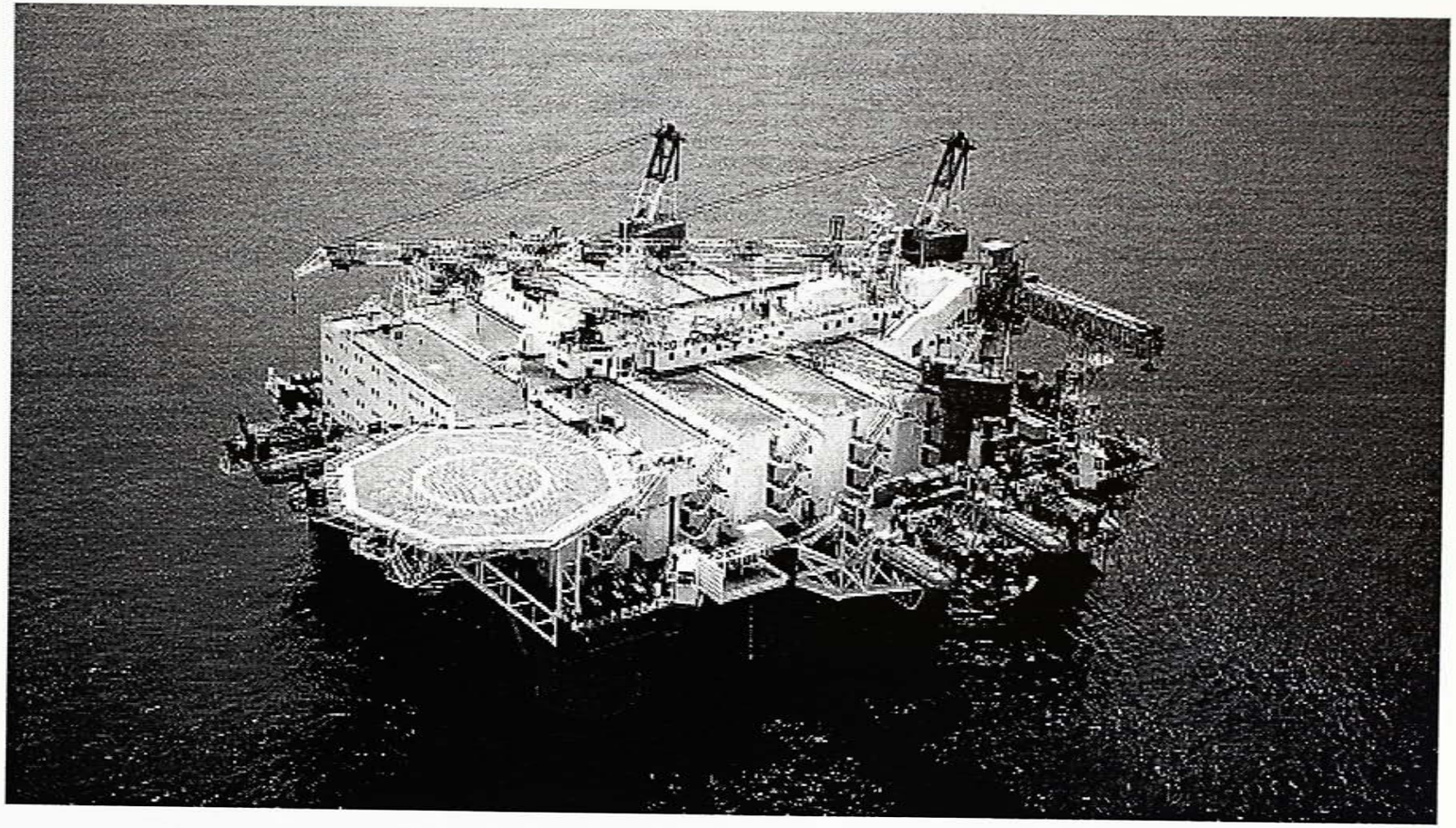
7.11
CASE STUDY 7

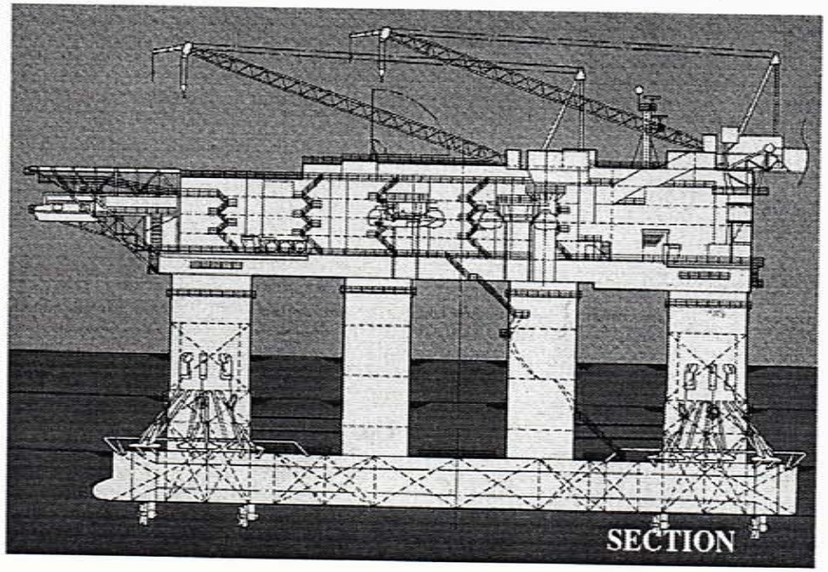
Floating Accommodation - Polyconfidence
built in
North Sea oil fields
designed by
Mitsui Engineering & Shipbuilding Co. Ltd.

This is a semi-submersible floating hotel for workers engaged in constructing a fixed platform or the oil fields in the North Sea. Special emphasis has been placed on security and amenities to enable the maximum of about 600 residents to fully enjoy their lives in safety. Complete firefighting, fire-detecting, and fire-extinguishing equipment has been provided in consideration of possible fires on adjoining platforms, and emergency floatation devices are fitted. In terms of amenities, the floating hotel has eight recreation rooms, a cinema with 190 seats, a gymnasium and a sauna.

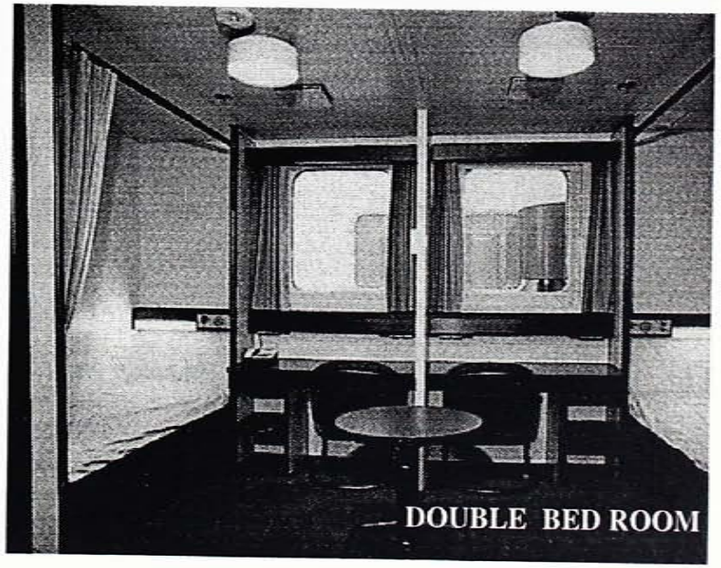
The moorings for this structure are supplemented be a high-reliability dynamic positioning system which makes use of thrusters to minimize pitching and offer a comfortable space.

PHOTO CREDITS
Akio Kuroyangi, Process: Architecture, no.96





SECTION



DOUBLE BED ROOM

8.1
SHIP TODAY

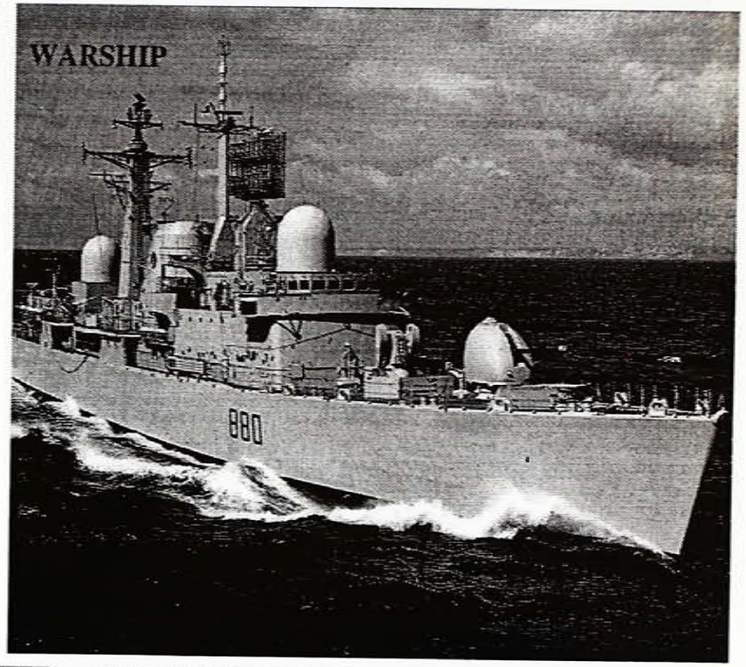
Ships are an essential form of transport. Nearly three quarters of the earth's surface is covered by water, and most of this water forms seas and oceans. Today, even though airplane transport is more fast, a suitably designed ship can transport a large load at an economical cost.

A typical modern ship is a steel-hulled vessel powered by an engine-driven propeller. However, nearly every ship is designed for a particular , specialized task and this is reflected by the appearance. The most important ships are cargo vessels. Amongst most modern cargo vessels are container ships and giant oil tankers.

Other ships in use today include a variety of specialized vessels, designed for such tasks as ferrying passengers and vehicles, fishing, exploration and dredging and even warships. All these ships are designed to meet particular needs using the most efficient technology available. Some ships even uses aerofoils as a device to utilitze wind to drive the ship forward.

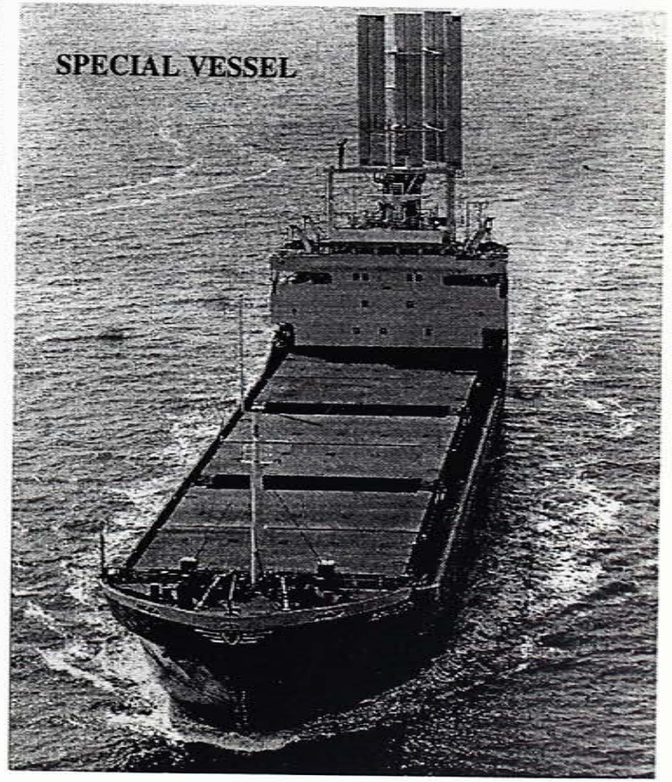
PHOTO CREDITS
Mark Lambert, Ship Technology ,
Wayland Ltd., 1989


CARGO SHIP



WARSHIP


PASSENGER SHIP


SPECIAL VESSEL

8.2
STAYING AFLOAT

PRINCIPLE

It is the principle of buoyancy that illustrates how ships works. When a ship is at rest, there are two forces acting on it, buoyancy and gravity.

The water pushes all around on the submerged hull. The total push exerted at the centre of the hull is the buoyancy force B, which is equal to the weight of fluid displaced. Therefore, a floating body displaces its own weight of fluid which is also called "principle of floatation."

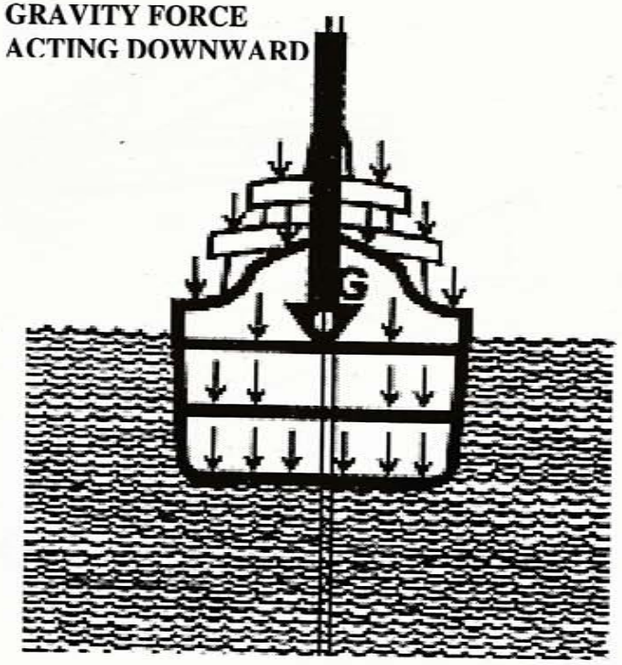
The downward force is simply the weight of the ship, G, acting at the centre of the ship.

LIMITS

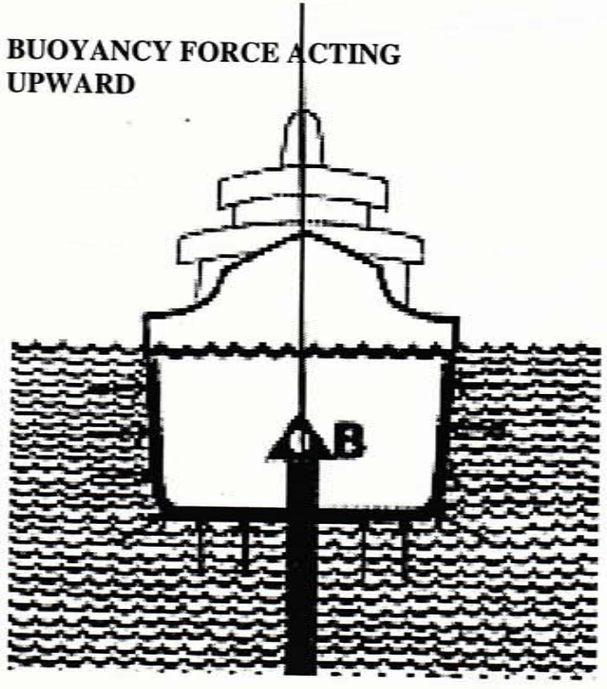
Ships are designed to carry cargoes. But clearly there is a limit to the amount of cargo a ship can safely carry; too much weight will endanger the ship in rough ships. Therefore, a mark, called the Plimsoll line is introduced to indicate the maximum depth to which it may be loaded.

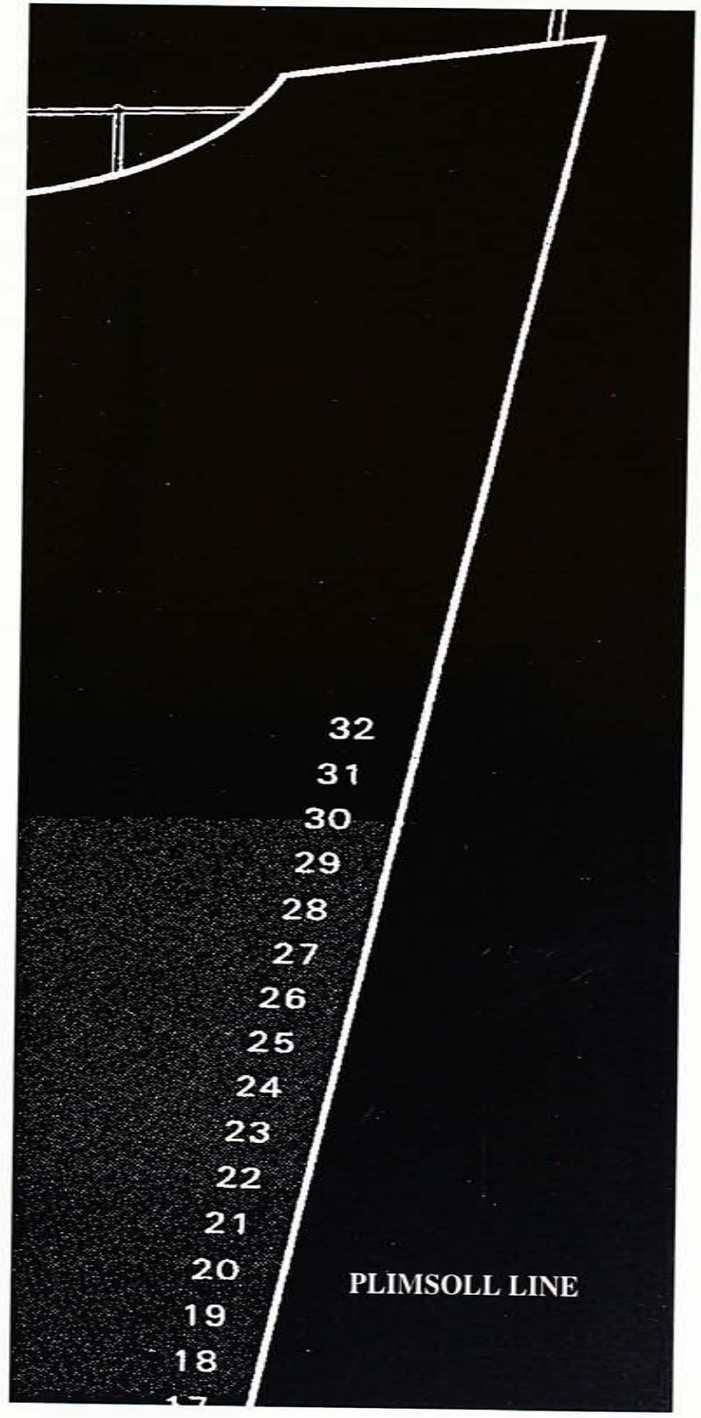
PHOTO CREDITS
Edward V. Lewis, Ship,
Time life books

GRAVITY FORCE ACTING DOWNWARD



BUOYANCY FORCE ACTING UPWARD

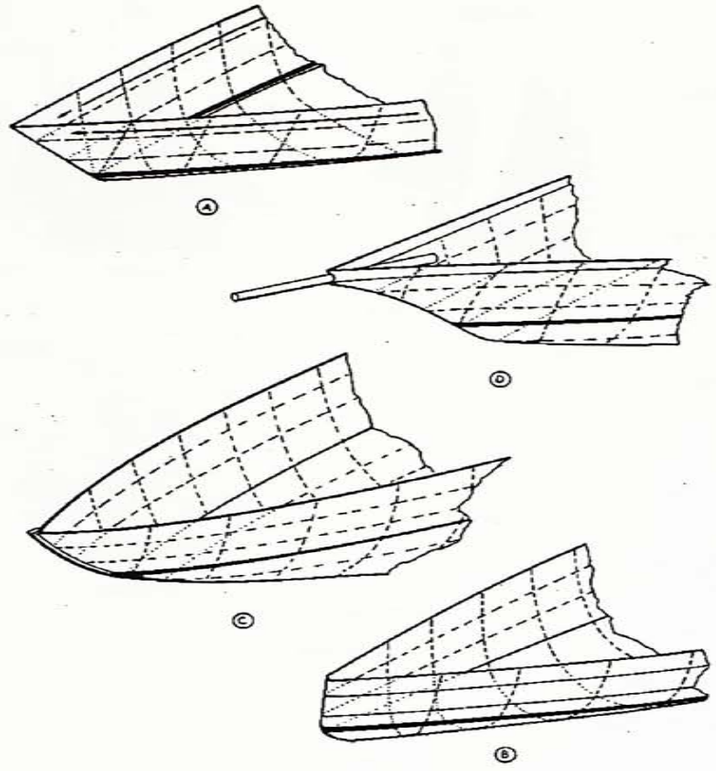


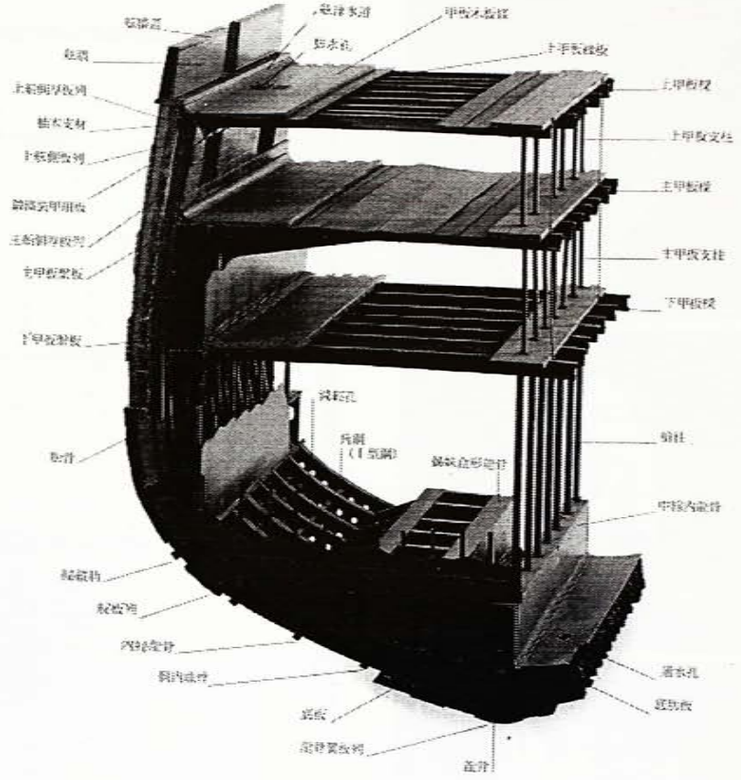


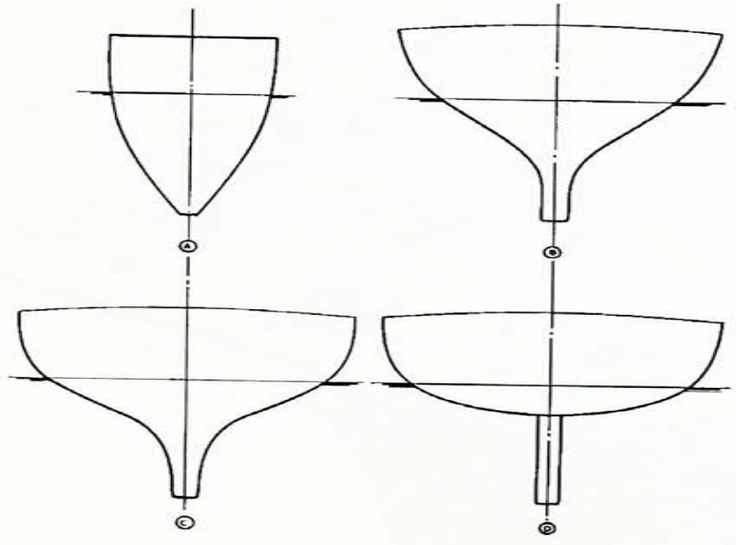
8.3
THE HULLS' SHAPE

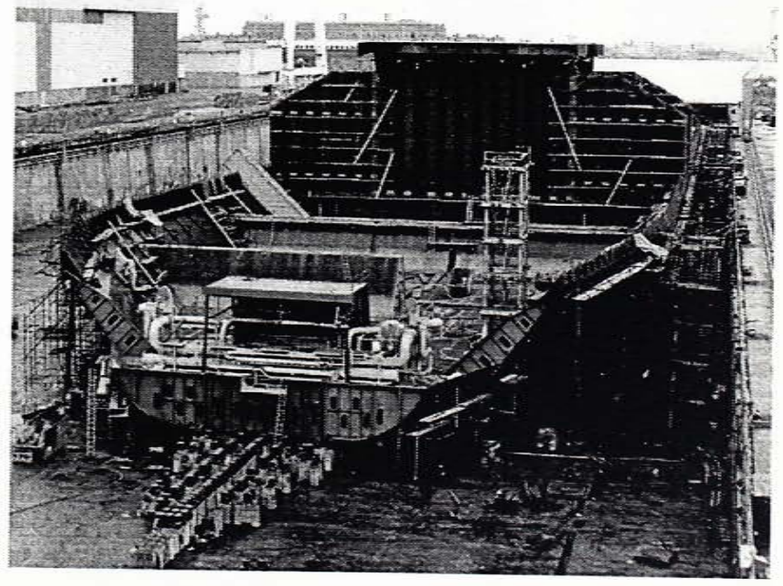
It is the principle of buoyancy that illustrates how ships works. When a ship is at rest, there are two forces acting on it, buoyancy and gravity.
much weight will endanger the ship in rough ships. Therefore, a mark, called the Plimsoll line is introduced to indicate the maximum depth to which it may ve loaded.

PHOTO CREDITS
Edward V. Lewis, Ship,
Time life books







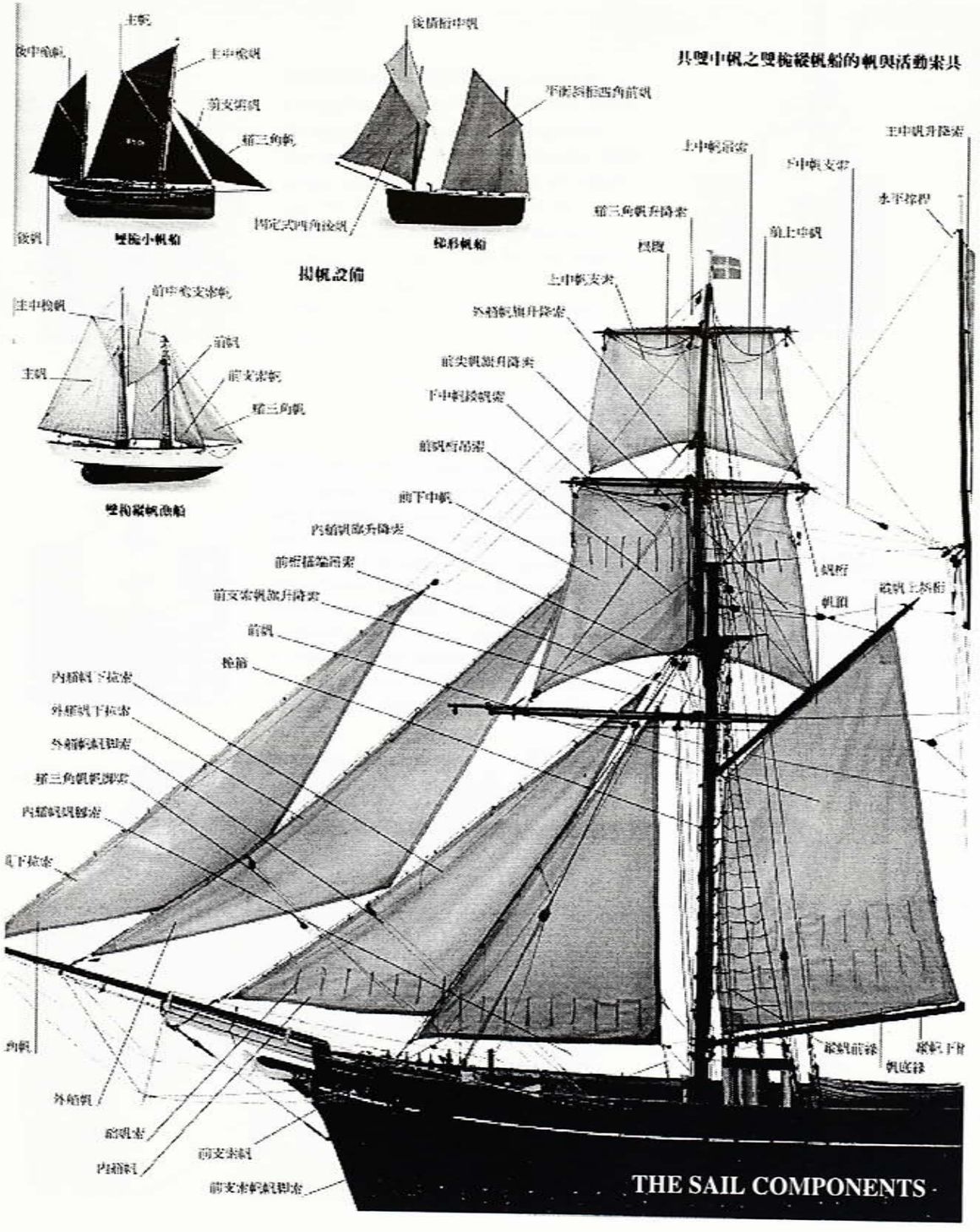


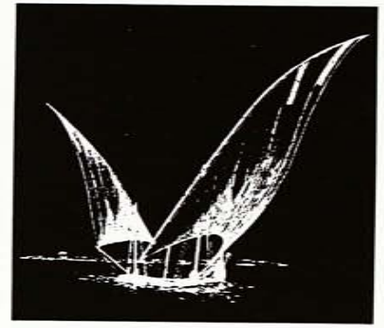
8.4
SAIL

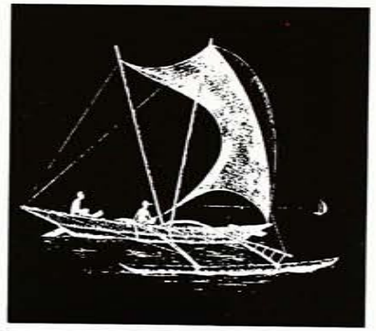
Sail is the oldest methods of making ships and boats move because wind and human muscle power were the only available source of power at the past. However, the main problem with wind power is that it is unreliable, All too often the wind blows too strongly from the wrong direction of not at all.

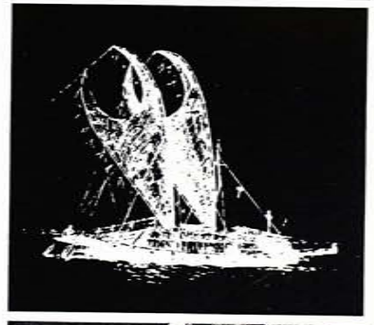
There are two types of sails, but they are usually mixed when used.

PHOTO CREDITS
Mark Lambert, Ship Technology ,
Wayland Ltd., 1989









8.5
STABILITY

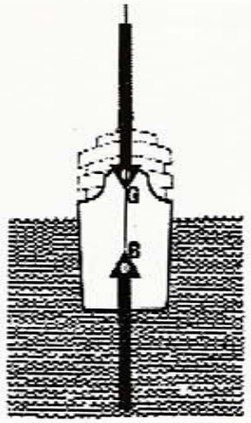
All ships have a tendency to roll from side to side, particularly in stormy conditions. Therefore, to make the ship stable id very important. Basically there are methods to achieve stability of ships.

AUTOMATIC STABILIZER
These are movable fins on one or both sides of the hull. They are controlled by gyroscopes. As the ship starts to roll the angle of each fin is automatically adjusted to counteract the rolling.

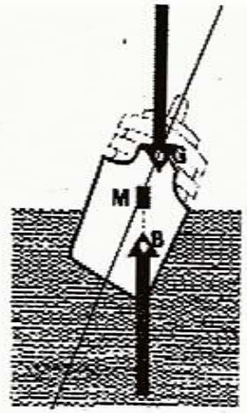
CENTRE OF GRAVITY
When the centre of gravity of the ship is lower, the stability is higher. This can be achieved by the height of the ship or adding heavy materials such as stones and coal into the lowest part of the ship.

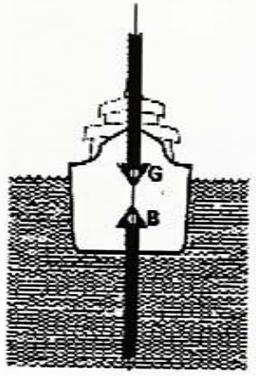
MULTIHULL SHIP

PHOTO CREDITS
Edward V. Lewis, Ship,
Time life books

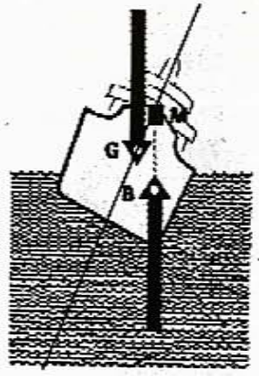


AN UNSTABLE SHIP cannot return to a normal upright position when tilted. Since the vessel is more narrow and top-heavy than a stable ship, B and G are located much farther apart *(arrows, left)*. When the vessel tilts, the force of G shifts toward the direction of the slope; together the two opposing forces act to heel the ship even farther until it capsizes. The metacenter M, instead of being above G as in a stable ship *(opposite page)*, is here well below it.

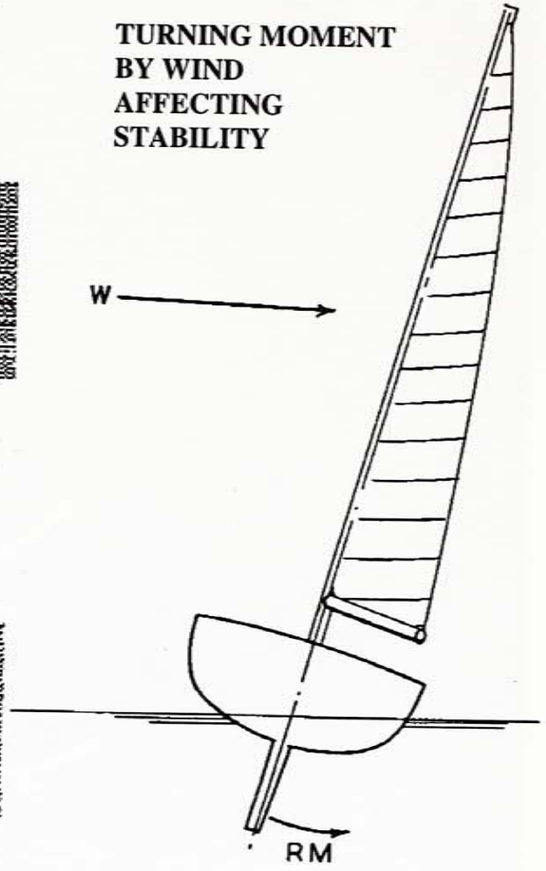




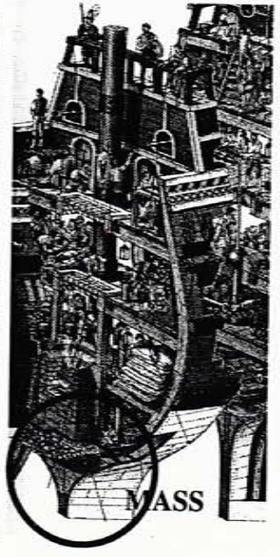
A STABLE SHIP is one that can right itself if it is heeled over. When it is upright, the ship's centers of gravity, G, and buoyancy, B, are in line. When the vessel is tilted, B moves in the direction of the slope so that its upward push combines with G's downward force to right the ship. This stability is measured by the position of the metacenter, M, a theoretical point where the upward force B meets the ship's vertical midline. The position of M above G here indicates good stability.



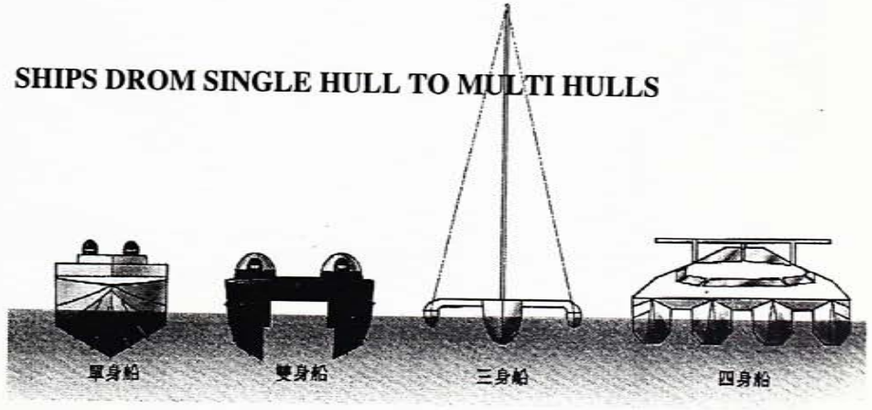
TURNING MOMENT BY WIND AFFECTING STABILITY



AUTOMATIC STABILIZER.



SHIPS DROM SINGLE HULL TO MULTI HULLS



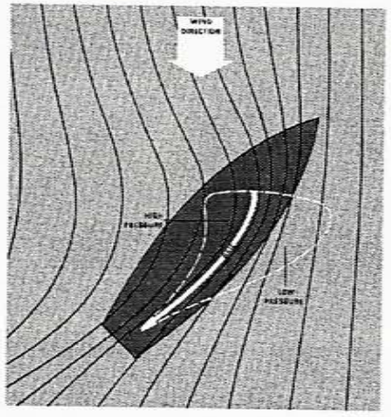
8.6
WIND AT WORK

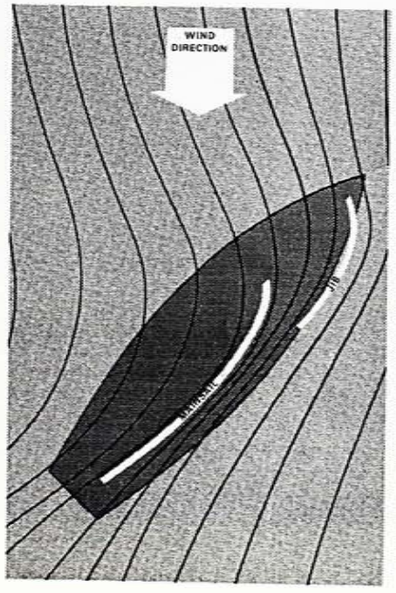
The two types of sail, though using wind as driven force for power, they have different use and limitations.

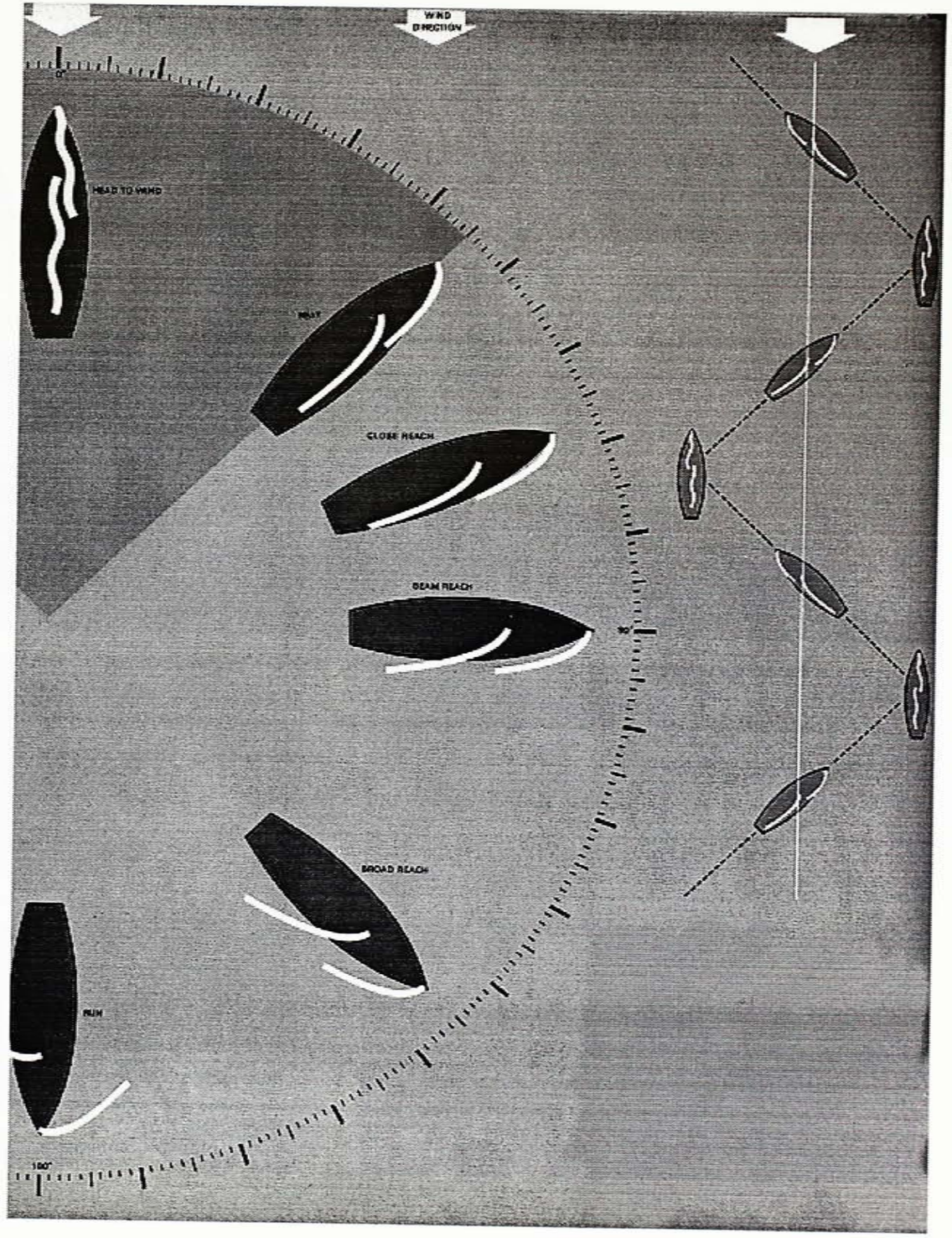
The first type of sail use one single sail that is faced with an angle with the wind direction so that the wind forces the ship to go. It is a simpler method of achieving and utilizing the wind.

The second type of sail use two sails instead of one single sail so that in additional to the normal wind force, there exists another pressure forces created between the gap between the two sails. When wind blows, the wind pressure will increase with speed. Wind cause a sucking effect in the gap so that it sucks the boat foreword.

PHOTO CREDITS
Edward V. Lewis, Ship,
Time life books







8.7
ENGINE

To utilize wind as power for ships is not always reliable as wind is an unpredictable power source. Therefore, every ship has an engine. Some ships use water jet engine, some use nuclear power engine, but most ships use diesel or steam propeller engine.

In the diagram, on the right, it shows three main parts of the mechanism of how a ship travels:

1. AIR IN

Air is intake to the propeller. There is a spiral machine acting like an air ventilator.

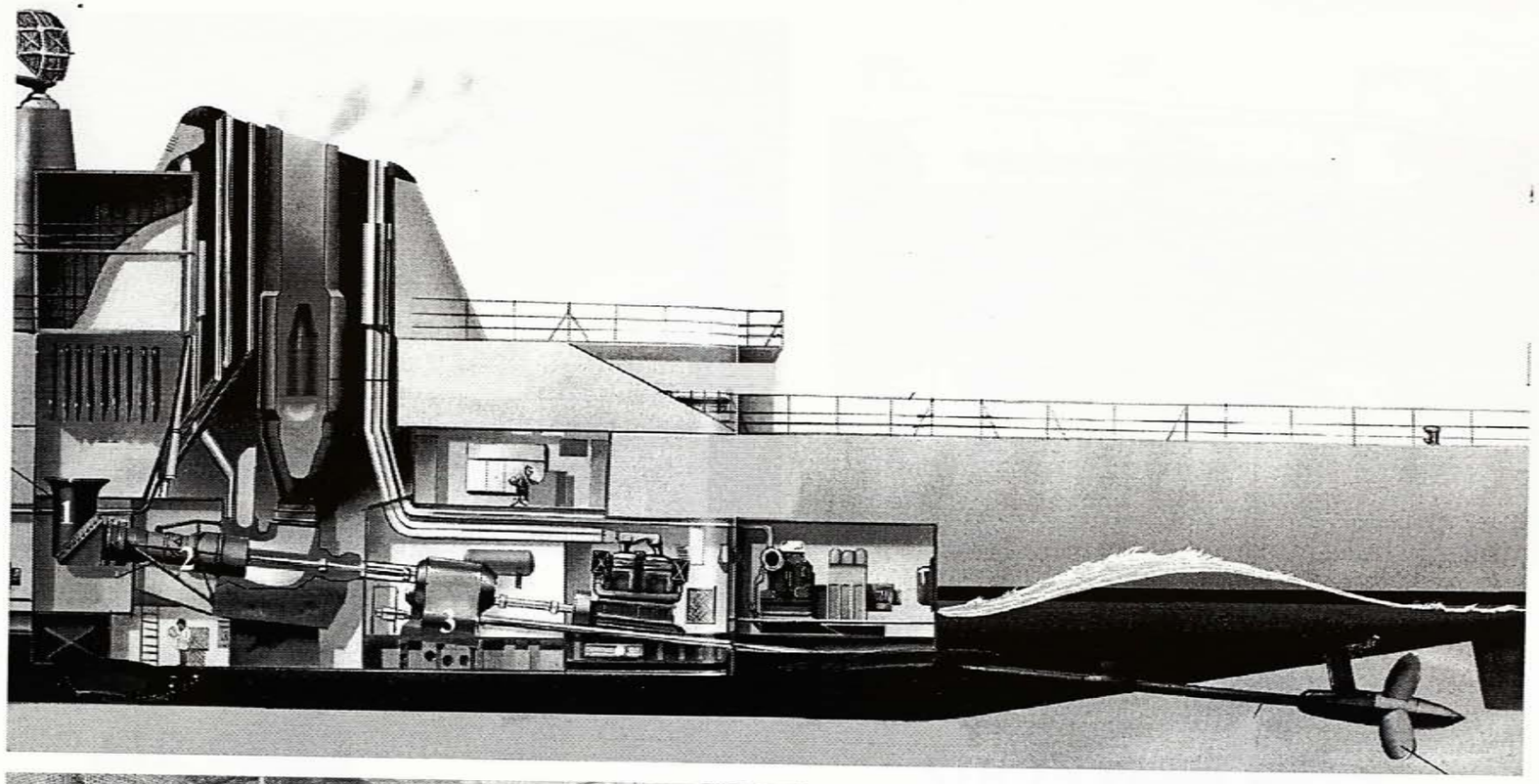
2. BURNING FUEL

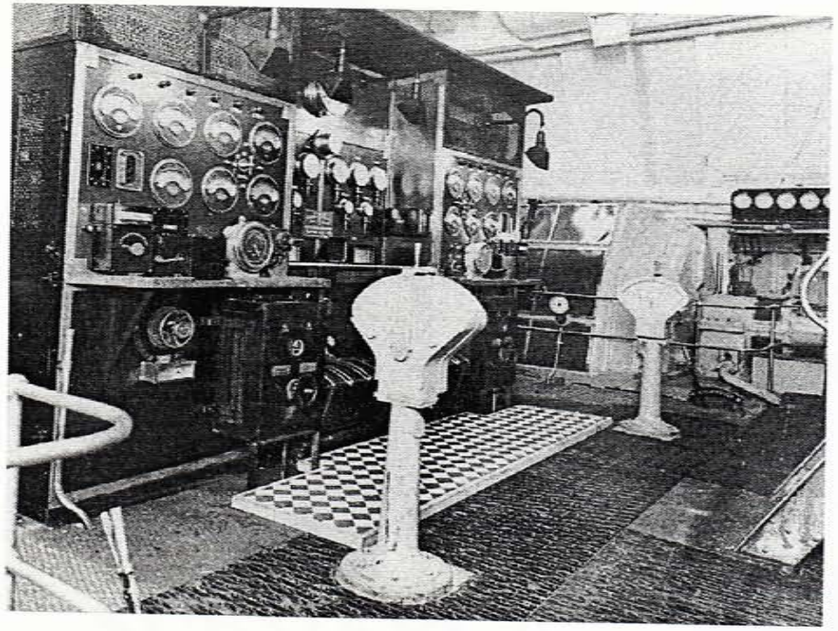
The air is compressed and put here and burn with the fuel and explode. The exhaust air is ejected through the chimney.

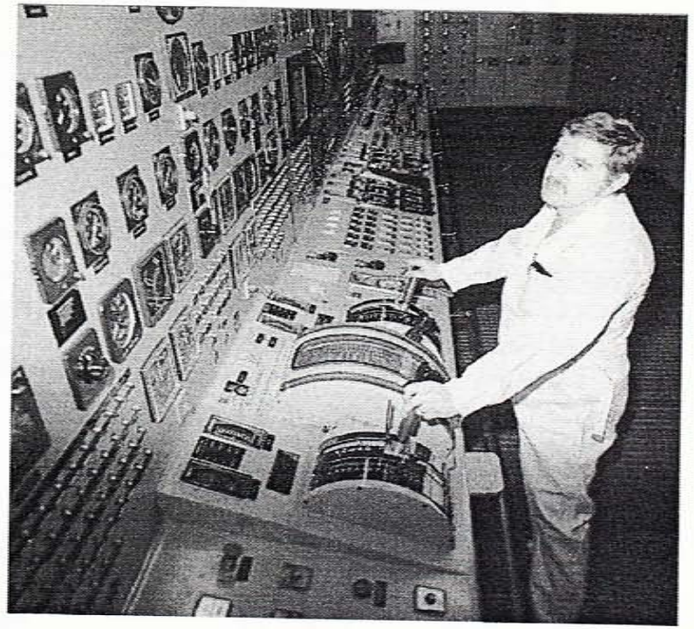
3. RETARDATION

There exists an machine that can be used for varying speed by varying the speed for rotating the axis.

PHOTO CREDITS
Mark Lambert, Ship Technology , Wayland Ltd., 1989







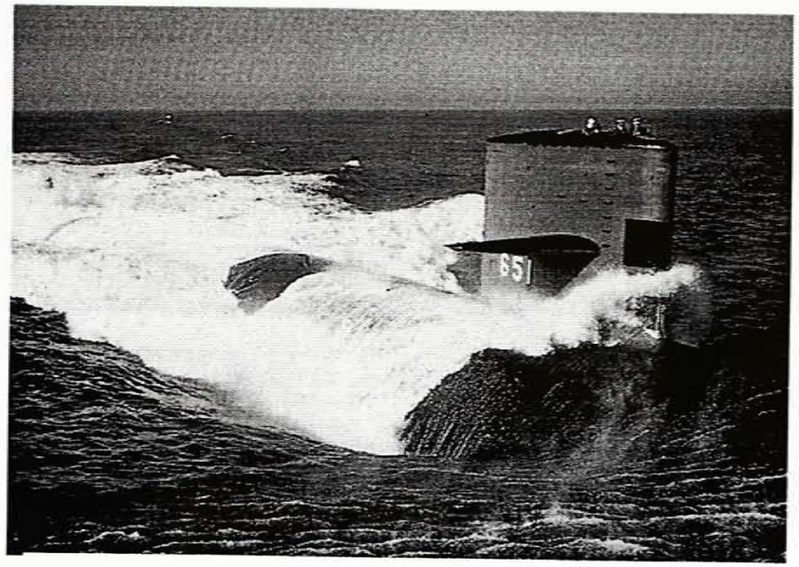
8.8
UNDERWATER VESSELS

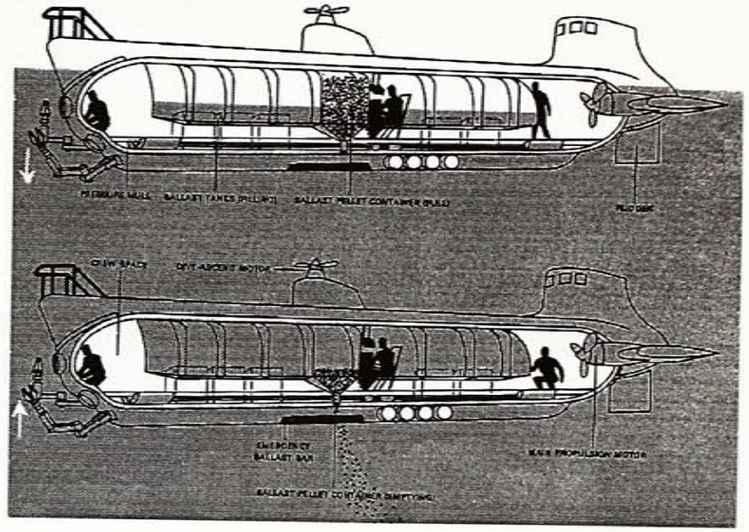
A submarine is made to rise and fall in the water by varying its buoyancy. The hull of it comprises two layers, in between which are buoyancy tanks. When water is allowed into these tanks, the buoyancy of the vessel decreases and it sinks. To make the submarine rise in the water, valves are opened and compressed air forces the water out of the tanks.

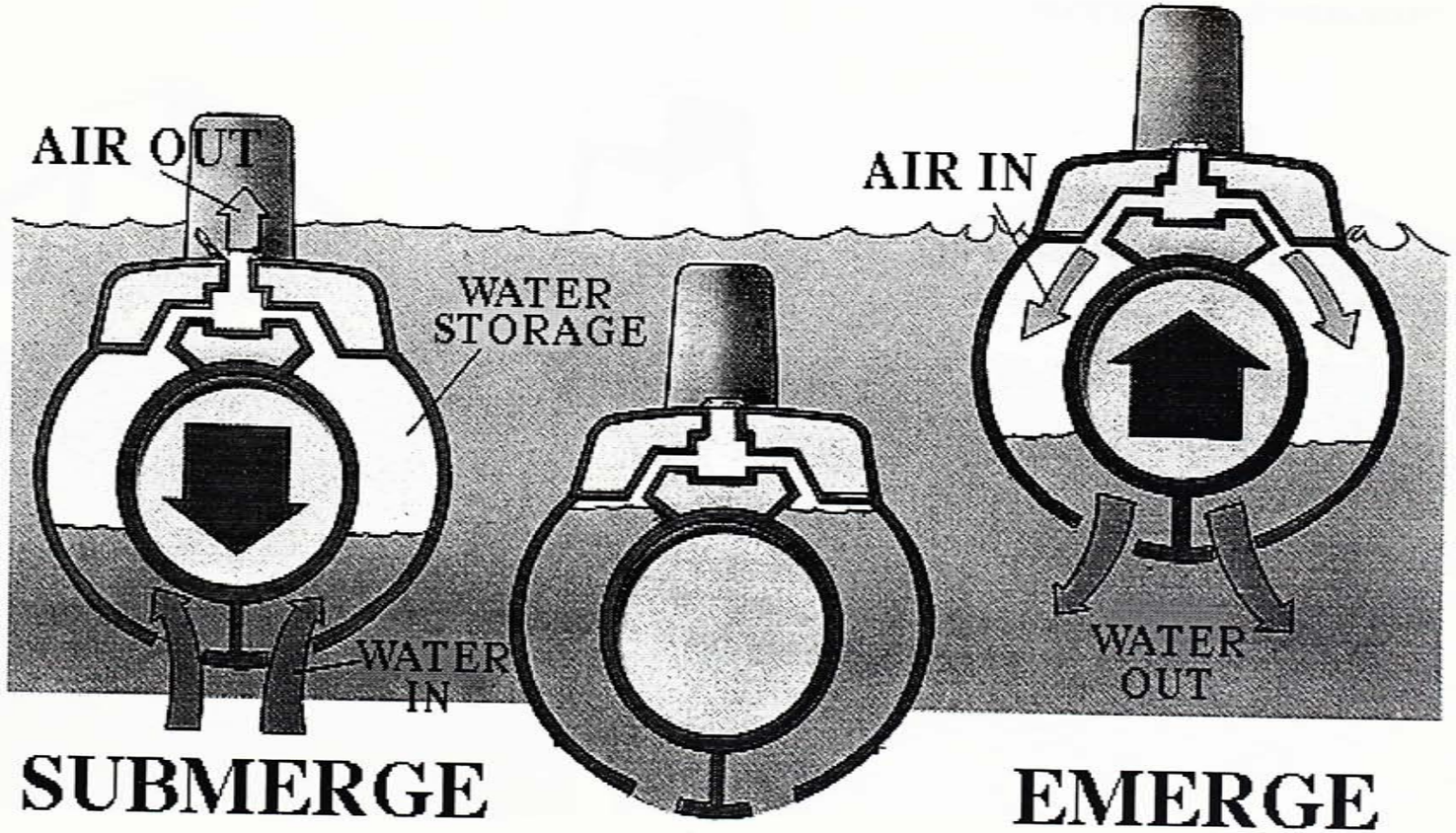
Forward thrust is provided by a propeller, which in a conventional submarine is powered by an electric motor. The electricity is supplied by batteries, which have to be recharged regularly, using diesel-powered generators. The high speed diesel engines are also used to drive the propeller when the submarine is traveling on or just below the surface.

Not all undercraft are warships. A variety of sophisticated vessels are now used for such things as deep-sea salvage and exploration.

PHOTO CREDITS
Mark Lambert, Ship Technology ,
Wayland Ltd., 1989







8.9
ABOVE THE WATER

One problem involved in propelling ship is the water waste a great deal of energy in overcoming the resistance of the water hull, limiting the speed of it. However, it is possible to reduce this problem, simply by lifting as much of the vessel as possible out of the water.

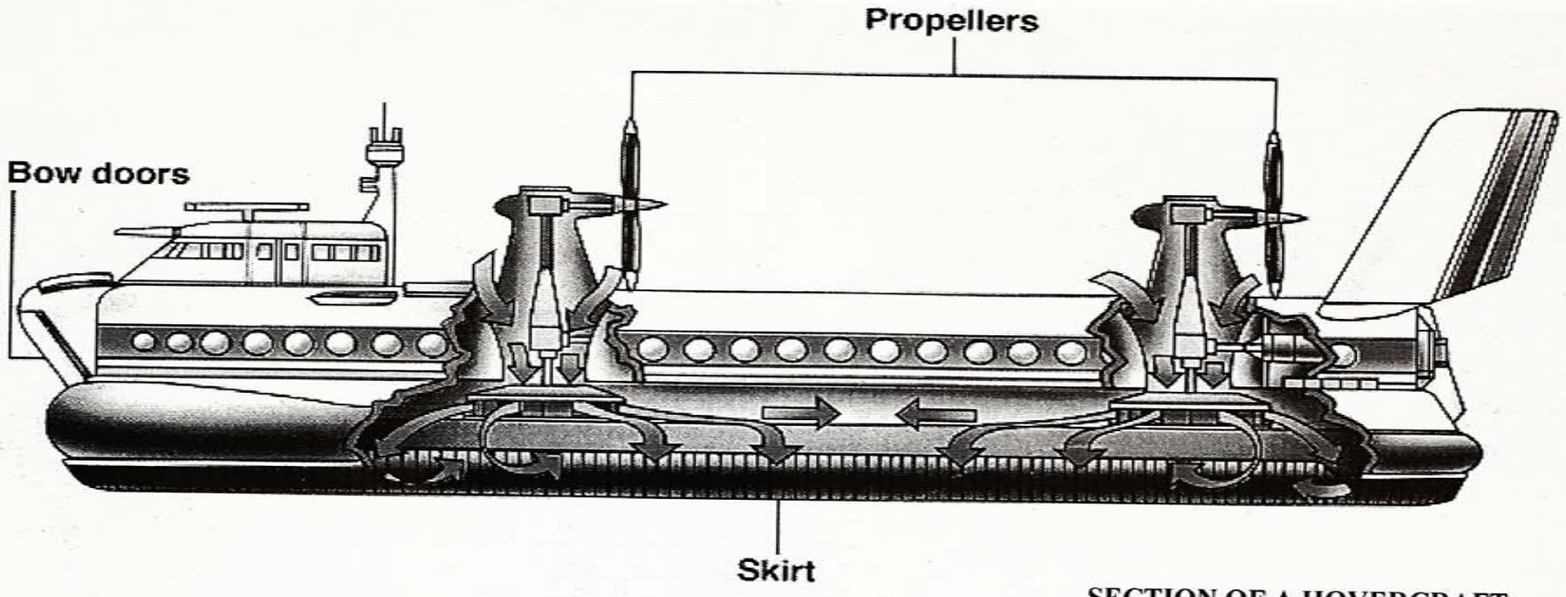
HYDROFOIL

The hull of the vessel is raised on stilts attached to underwater foils, that look and like an airplane wings. When the craft is not moving, the hull rests on water in the normal way. but as it begins to move forward, the foils start to generate lift and the whole craft rises.

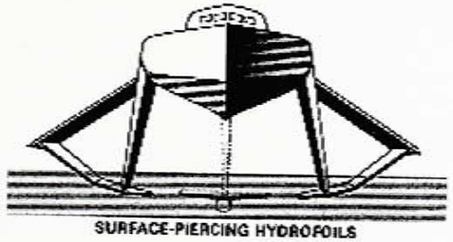
HOVERCRAFT

This solution is to raise a vessel on a cushion of air. One or more fans generates a downward jet of air around the lower rim of the craft. This creates and maintains a cushion of air underneath. A large hovercraft has a flexible skirt around its lower rim, which causes the craft to rise.

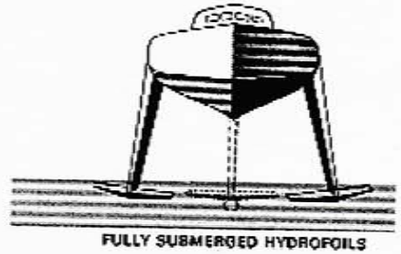
PHOTO CREDITS
Mark Lambert, Ship Technology ,
Wayland Ltd., 1989



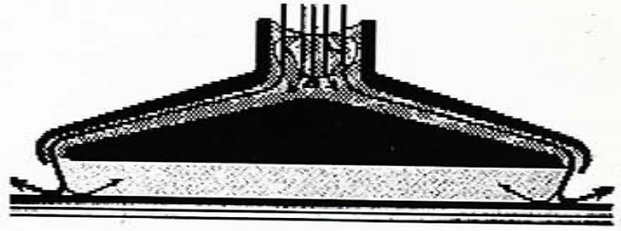
SECTION OF A HOVERCRAFT



SURFACE-PIERCING HYDROFOILS



FULLY SUBMERGED HYDROFOILS



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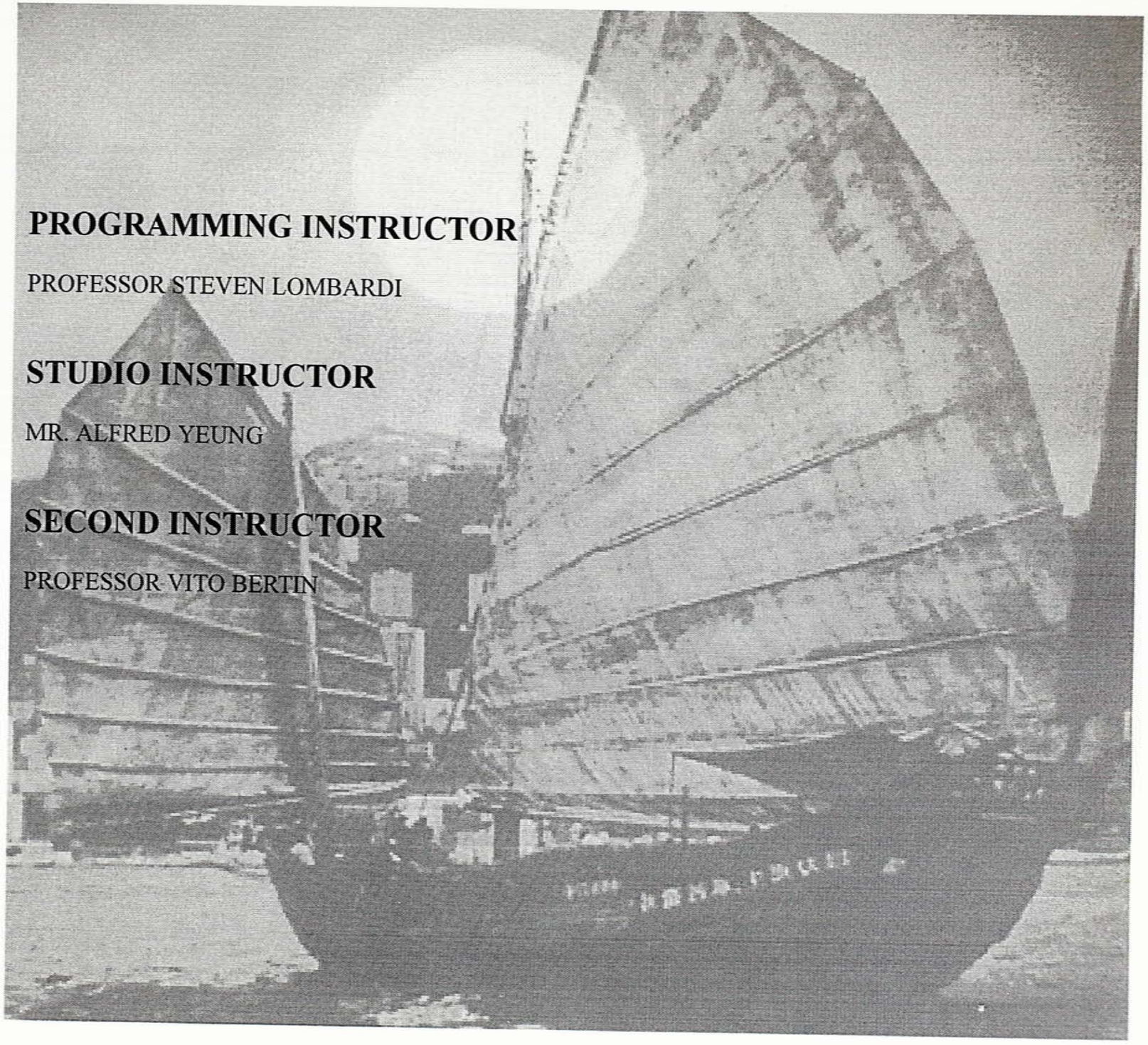

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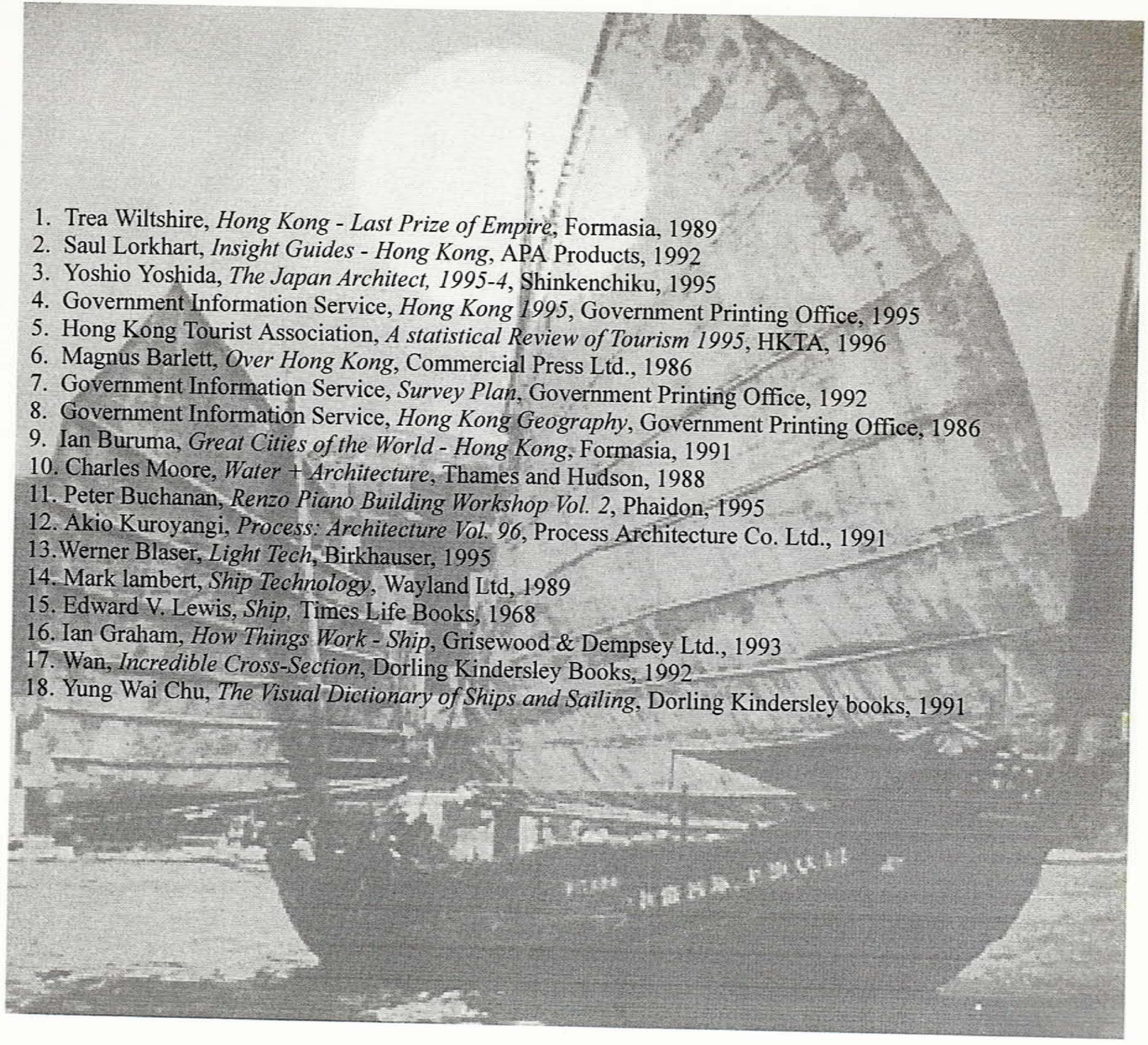
BIBLIO GRAPHY



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